Rubber Journal and International Plastics

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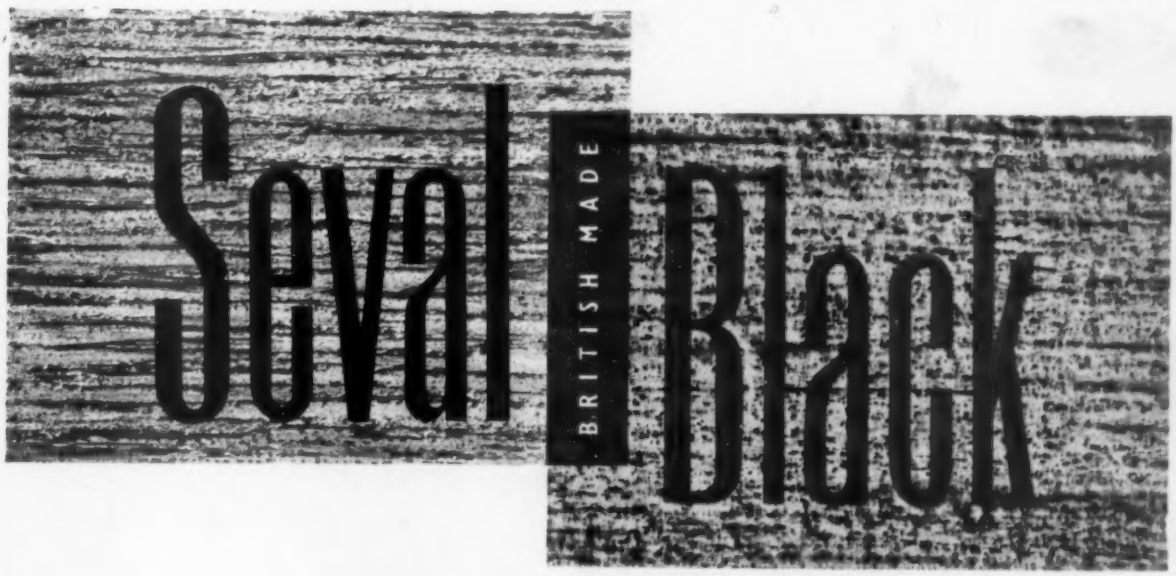

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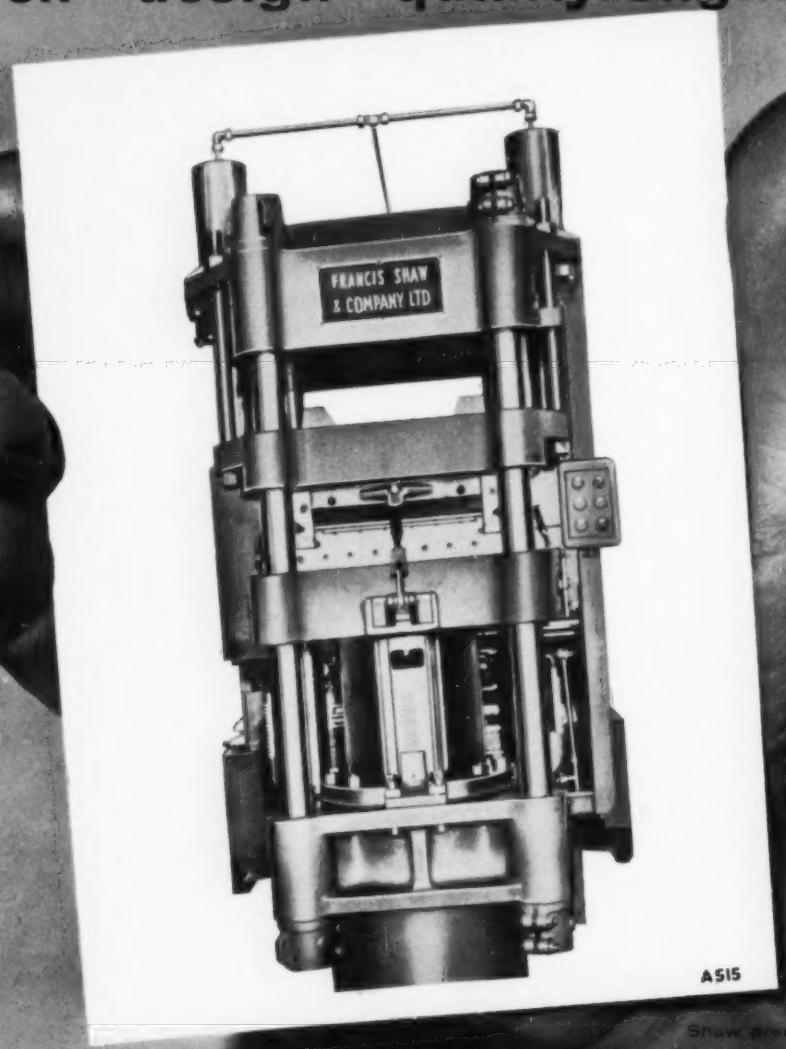

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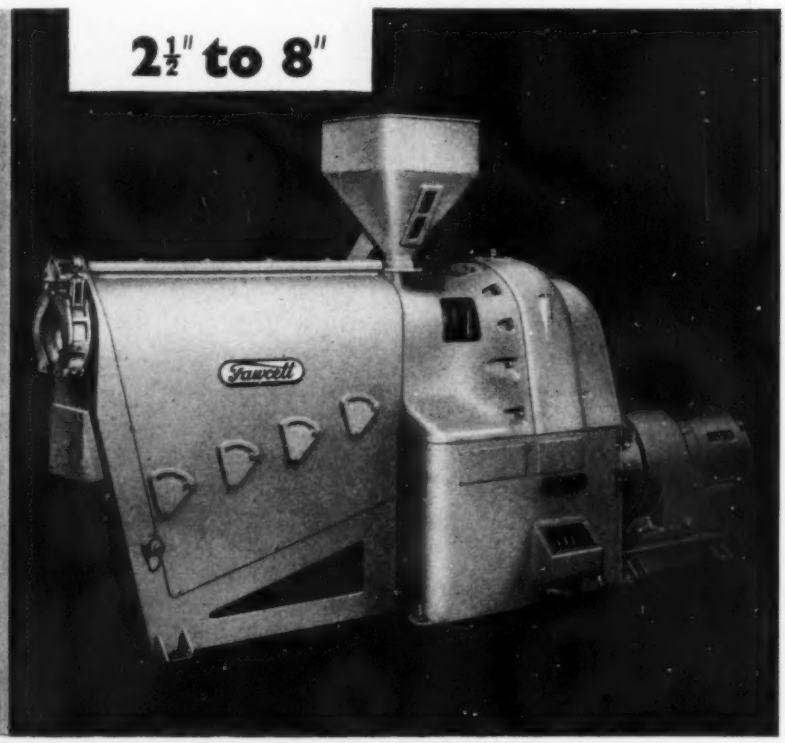

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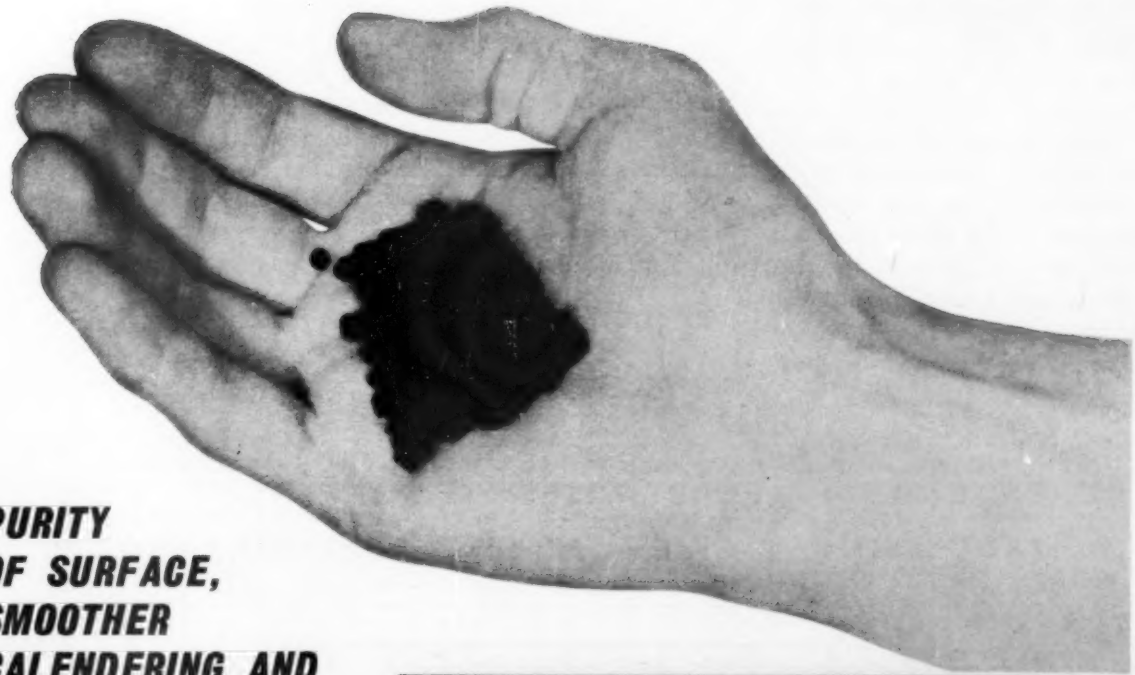

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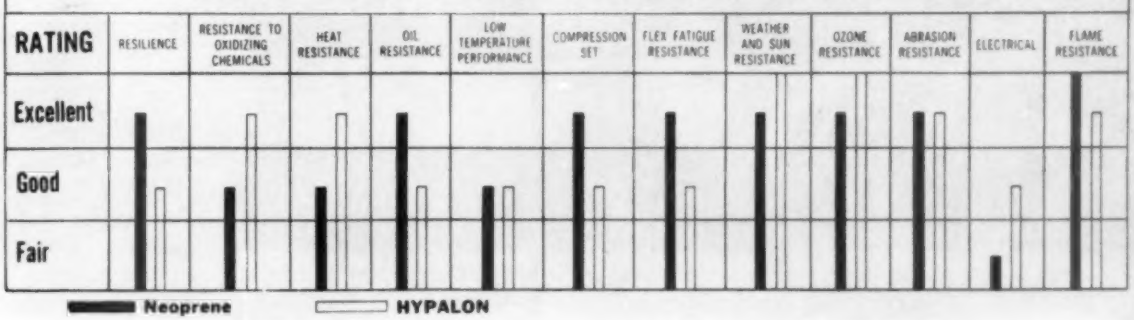
Based on Averages—Individual Properties are Dependent on Compounding Ingredients and Processing Techniques



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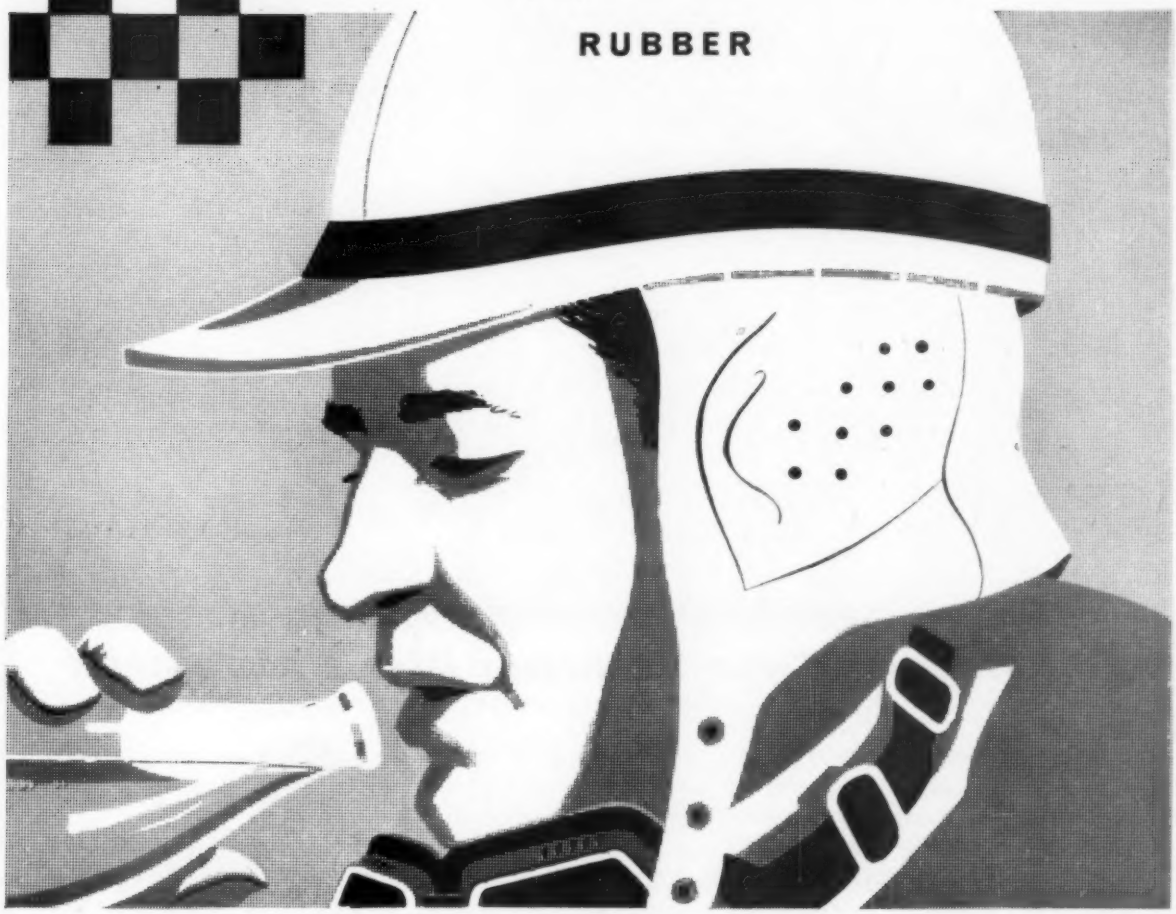

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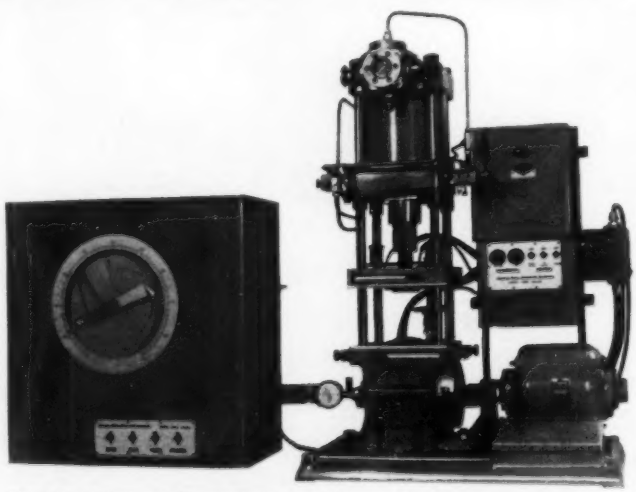

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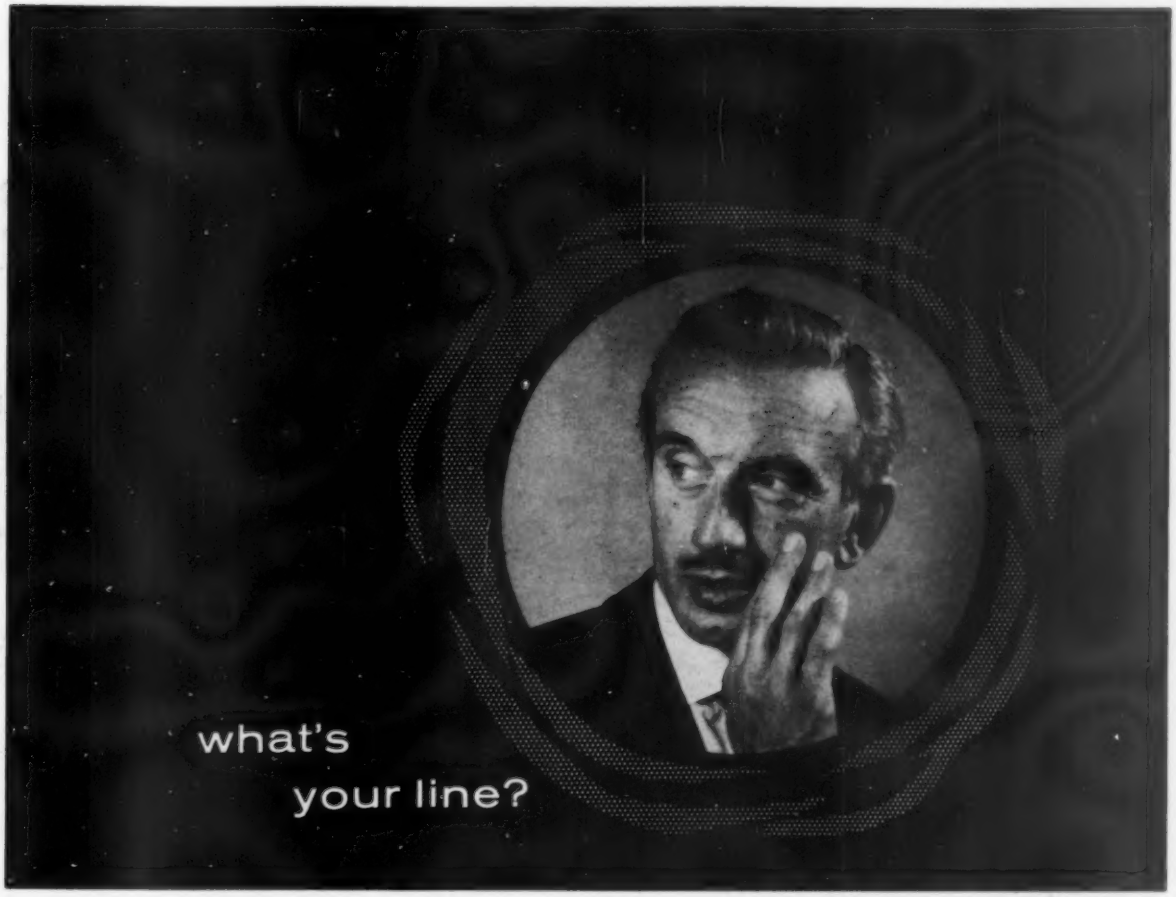

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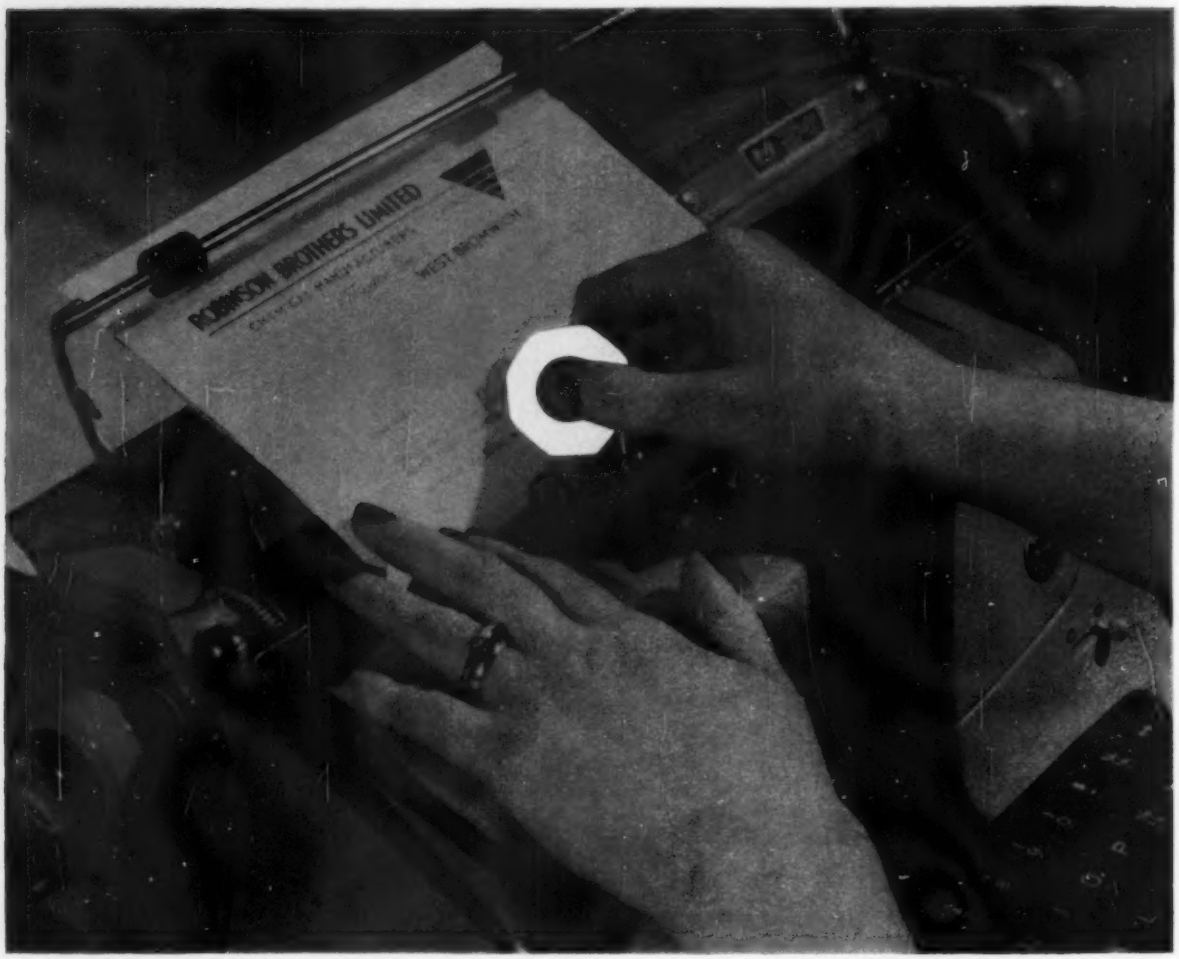

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Rubber Journal and International Plastics

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IN ITS 76th YEAR

February 20 1960

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STRETCH

NOTES of the WEEK

Price Index

THE Wholesale Price Index of the output of manufacturing industry, published by the Board of Trade, showed as a whole little movement between December 1959 and January 1960. Some of the changes as between January 1959 and January 1960 were, however, quite marked. Index figures for commodities produced in the United Kingdom include the following (1954=100): Synthetic resins and plastics materials—January 1959, 91.0. January 1960, 89.8. Rubber tyres and tubes—January 1959, 121.6. January 1960, 119.4 (A provisional figure). Rubber footwear, January 1959, 117.4. January 1960, 120.9. Rubber goods (other than tyres and tubes), January 1959, 109.8. January 1960, 111.6. Plastics mouldings, January 1959, 103.4. January 1960, 102.9. The most remarkable movement, in the section for commodities wholly or partly imported into the UK, was not surprisingly natural rubber. The figures for No. 1 RSS, one month future were, January 1959, 125.7 and January 1960, 167.1. The November 1959 figure was highest at 178.6

State Responsibility

THE assertion that the State must take the prime responsibility for training for industry, from the point of view both of quality and quantity, is contained in an interesting and somewhat controversial report, published last month, by Dr Kate Liepmann, research fellow at Bristol University. Given as the reason for this statement is the author's view that the vested interests of employers and trade unions in the apprenticeship system reduce productivity and adversely affect the flexibility of the economy. 'The trade unions,' she says, 'have acquiesced in the scanty training given to great numbers of craft apprentices and in dilution, *i.e.*, the upgrading, without formal training, of semi-skilled operatives. The employers have acquiesced in the continued recognition of de-skilled occupations as apprenticeable trades and thereby in the existence of a privileged group of workers, non-justified by superior skill. In leaving the majority of workers, who are outside the apprenticeship system, without the training which is required in the national interest, the attitude of the two sides of industry is the same, for different reasons: the employers' reason is the costs of training; the craft unions' motive is that of maintaining exclusiveness of training as a means of protecting the privileges of their members. Dr Liepmann, whose report, *Apprenticeship*, is published by Routledge and Kegan Paul, goes on to make the point that so long as the high costs of the present system can be passed on to the domestic consumer and 'so long as the urgent need for competitive prices is not brought home to industry, the two sides of industry are not likely to change their apprenticeship policy. The apprenticeship system with all its failings is sheltered by the full employment policy and by the hingeing of wages on the cost of production *via* the cost of living index.'

Training in Rubber

TAKEN in connection with the above mentioned views, the first report of the Industrial Training Council, published at the end of last month, is not without interest. It should, of course, be recognized that the task of the ITC is to act through employers' organizations and bodies composed jointly of employers and trade unions to stimulate individual companies to improve their training; particularly in view of the 'bulge' years 1961, 1962 and 1963. The report tells of the progress being made by some 60 such bodies. The note on the Rubber Manufacturing Employers' Association states that in view of the nature of the work, apprenticeship schemes for rubber workers are not required and operatives are able to pick up their jobs in a fairly short time without organized training. However, employers hope to be able to take on more young people and to provide, in the City and Guilds course in rubber workshop practice, facilities for further education and training. Most rubber factories already operate their own apprenticeship schemes for engineering and maintenance workers and train sufficient personnel for their requirements. As more young people become available steps will be taken to increase the numbers of apprentices in training.

Rail Claims

CLAIMS in respect of goods sent by rail not infrequently come up against time-limit regulations. It is worth remembering that when loss from a package or from an unpacked consignment, or damage, delay or misdelivery are alleged, written complaint must be made to the railway company within three days and written claim lodged within seven days of termination of transit. When non-delivery of the whole consignment is alleged, 28 days are allowed for a written complaint and 42 days for written submission of claim. These times apply to goods carried by goods or passenger train, at either company's or owner's risk. If and when there is pilferage of goods carried by passenger train at owner's risk the pilferage must be pointed out to British Railways on delivery. In a recent case a firm found that British Railways refused to entertain a claim because a consignment, afterwards found to contain damaged goods, was signed for as 'unexamined.' It appears the approved practice nowadays is to sign 'Contents Unknown.'

NEWS *Briefs*

ESSO TO PIPE ETHYLENE TO I.C.I. SEVERNSIDE
ITALY SELLS STOCKS—UK MELAMINE PROJECT
ASBESTOS DISCOVERY — MOSCOW CONTRACT

●**United Kingdom**—Industrial Plastics Ltd., in conjunction with East Anglia Plastics Ltd., have been awarded a contract by Techmashimport of Moscow, worth about £100,000. This provides for the complete installation of a plant to produce about 3,000 tons of cellulose acetate moulding powder per annum. The contract is to be completed by May 1960.

●**Germany**—Manufacturers in Germany of phenolic moulding powders have announced price increases for these materials of from 5½% to 7½% according to grade and type. Use of phenolic moulding powders in Western Germany in 1959 amounted to approximately 33,500 tons, which compares with 33,900 tons in 1958.

●**United Kingdom**—British Oxygen's extensive carbide works at Londonderry are near completion, and the supply of bulk acetylene to the adjacent Du Pont neoprene factory is expected to commence in March.

●**Holland**—N.V. Vereenigde Nederlandsche Rubberfabrieken - Heveafabrieken, Heveadrop, and the Dayton Rubber Co., Dayton, Ohio, have formed a joint sales company for selling industrial and other rubber products. Tho new company will be at Arnhem. The Dutch firm also has obtained a licence for the manufacture of the American factory's products, as a result of which their production programme will be considerably extended.

●**United States** — US Industrial Chemicals Company has started selling powdered polythene and expects to start pilot plant production next month. The powdered polythene will be used as textile coating, drum linings and specialized paper coatings, the company said. The pilot plant will have an initial capacity of two million lb. and is located in Tuscola, Illinois.

●**Italy**—The Italian Transport Ministry is to sell 1,000 tons of raw natural RSS rubber from the Government stockpile by public tender, it was announced on February 13.

●**United Kingdom**—Plans for construction of a melamine plant were announced on February 15 by Cyanamid (GB) Ltd. The project involves a total investment of more than £430,000. The manufacturing plant will be at Gosport. and will have a capacity of 6,000,000lb. of melamine a year; it is scheduled for completion by early 1961.

●**France** — Industrial production of low pressure polythene is to start shortly at Société Normande de Matieres Plastiques' plant at Lillebonne in northern France. Société Normande is a subsidiary of Pechiny; the initial production rate at the plant is expected to be 7,000 tons per year.

●**United States**—Allied Chemicals has selected Orange, Texas, as the site for its new high-density polythene plant, which is expected to be completed late this year. Output at the company's present plant at Tonawanda, N.Y., increased 25% last year, and will be further stepped up during this year.

●**Malaya**—A rubber warehouse owned by the Lee Rubber Factory was completely destroyed by fire last week. A spokesman said the rubber lost was valued at $800,000.

●**South Africa**—Engelhard Industries have taken out a controlling interest in the Durban company Perta Chemical Industries. Perta's polymer division will now be developed on a much wider scale, it is reported, and new polymer and copolymer resins will be manufactured, particularly for the paint industry.

●**United Kingdom**—Esso is to spend a further £5.5m. on its £10m. plant at Fawley. Main reason for expansion is said to be the agreement to supply ethylene to I.C.I.'s new Severnside plant (see page 267). Plans are for the ethylene to be transferred to I.C.I. along a £800,000 70-mile pipeline.

●**Canada**—What is claimed to be a major discovery of high grade asbestos was announced in Montreal on February 16. Drilling at Ungava, Northern Quebec, has revealed an estimated 7m. tons of asbestos.

●**United States**—The House of Representatives has approved the Government's plan to sell 470,000 long tons of natural rubber over nine years. The General Services Administration, which began sale of natural on October 16 (*RJIP*, November 14 and December 12), said that now the disposal plan 'would average out at about 50,000 long tons per year.'

●**East Germany** — A second trade agreement has been finalized between the East German Chamber for Foreign Trade and the Federation of British Industries which may mean exchanges worth £7m. both ways. Quota list of British exports to East Germany includes plastics and various chemicals.

'I make up tyre manufacturers' advertisements — what's your racket?'— 472

I.C.I. on Severnside

PLANT CONSTRUCTION TO BEGIN

A START is to be made on I.C.I.'s new thousand-acre site in South Gloucestershire, three miles north of Avonmouth. Construction work will begin in the Spring, and will be supervised by I.C.I.'s own staff. The plants are expected to start production in about two years time.

The first stage of construction on the site, which will be known as Severnside Works, will involve spending about £5m. on the initial site development and on the construction of plants for making 35,000 tons per annum of ethylene oxide, ethylene glycol and associated products. The main raw material, ethylene, will be supplied by Esso Petroleum Co. Ltd.

The ethylene oxide will be made by the air oxidation process developed by Scientific Design Company Inc., who will also design the plant. The plants for ethylene glycol and associated products will be designed by I.C.I.'s own staff.

The initial site development and provision of services will be in accordance with plans made since 1957, when I.C.I. first announced its long-term intention to develop a large chemical factory on Severnside. The general pattern of development of this works is expected to resemble in many respects that of I.C.I.'s Wilton Works in North Yorkshire, where more than £100 million has been spent since 1949 and where investment in new plants still continues.

The growth in the demand for ethylene, used principally in making 'Alkathene' (I.C.I.'s brand of polythene) and ethylene glycol, which in turn is used in making 'Terylene' polyester fibre, is continuing so strongly that the output at Wilton is being expanded as quickly as possible in addition to the arrangement to draw supplies from Esso. When these plans come into effect, I.C.I.'s ethylene supplies in the UK will total 180,000 tons per annum besides the substantial quantities made overseas by plants of subsidiary companies in Canada, Australia and India. There will be corresponding increases in the output of associated products at Wilton, including propylene and butadiene, and in the output of plants using these olefines.

US TYRE PRICES UP

Goodyear Tire and Rubber Co., Akron, Ohio, has announced a rise in replacement tyre prices of 3% on certain of its passenger tyre lines and from 3% to 5% on most truck tyres, which is now effective. Other increases, the company said, include 3% on farm and implement tyres, 3% on industrial pneumatic tyres and tubes and a 5% increase on truck tubes in larger sizes. The company blames increased wages and increased cost of natural rubber for the rise.

The United States Rubber Co. and Firestone have announced similar increases, which are also now effective.

Production at the Dunlop factory at Speke, near Liverpool, has not yet been affected by the strike of 450 maintenance engineers, a company spokesman said on February 16.

Blacks Down

Philblack Ltd. have announced a reduction in the prices of certain carbon blacks. The grades affected, and the new prices which came into operation on February 15, are as follows (minimum 3-ton lots, ex works): Philblack 'A' FEF, 7½d.; Philblack 'I' ISAF, 10d.; Philblack 'E' SAF, 1s. 0¾d.

US LOAN FOR INDIAN PLANT

The US Export-Import Bank announced on February 15 that it was making three loans in Indian rupees to industrial firms in India totalling 42,600,000 rupees.

All three companies are joint ventures involving United States and Indian private concerns. The largest loan, 27,100,000 rupees, will go to India Synthetics, formed recently by the Firestone Tyre and Rubber Company of Akron, Ohio, and Messrs Kilachand, Devchand and Company Ltd., of Bombay. The loan will be used to assist in the financing of a synthetic rubber manufacturing facility near Bareilly, Uttar Pradesh. It is repayable over a nine-year period.

Foam Plant Recovers

Production of foam at Dunlop's Rochdale factory will start again in a week or two, according to a company spokesman. The factory was badly damaged by fire on February 3.

The giant foaming machine has escaped damage, and the only problem now is with material mixing.

Rubber tyres and tubes will be imported from India by Indonesia under the terms of a trade agreement which has been recently extended.

USSR Chemical Industry

According to the Central Statistical Board of the USSR Council of Ministers, reporting on the results of the fulfilment of the State Plan for the USSR's economic development in 1959, chemical equipment to the value of 1,700,000,000 roubles (155% of 1958 output) was produced. Other output figures announced included synthetic fibres, 179,000 tons (108%). It is also stated that the plan for the output of synthetic resins and plastics as a whole and for many major types of these goods and for artificial fibres has been exceeded.

In comparison with 1958 the output of synthetic resins and plastics has gone up by 13%. This includes a 40% increase in the production of carbamide resins and a 24% increase in the output of polychlorvinyl resins and copolymers for the cable and consumer goods industries.

Compared with 1958, State capital investments in the chemical industry increased by 59%; while labour productivity in the chemical industy went up by 5% as compared to 1958. The number of specialists in the chemical, technical, physical and mathematical sciences increased by 14%.

Cleaner Components

The new Electrolux cleaner (model 65) is interesting from the number of plastics components it contains. The front and rear end covers, the handle, the thread nozzle and other parts are all made from ivory acrylonitrile butadiene styrene (Cyclolac). The connexion cover for the carpet shampoo and paint sprayer is in rose HD polythene, the threaded locking ring for extension tubes is in rose nylon, and the body for the dusting attachment is in rose PVC. The components are made by the Plastics Division of UMP, Salford.

Over a quarter of a million Vinylex floor tiles, made by Semtex from Geon PVC, have been used to cover the floors of 21 branches of Boots the Chemists during a recent programme of reconstruction.

Polythene

PART III—INJECTION MOULDING

(Continued from February 13 issue, page 234)

By L. HINDS, Ph.D., B.Sc., A.R.I.C.S. (I.C.I. Ltd.)

POLYTHENE is one of the most widely used injection-moulding materials in the world. It has a wide moulding-temperature range, excellent flow characteristics, good heat stability and is not sensitive to moisture. In moulded form, it possesses an outstanding balance of physical properties. It is being used to an increasing extent in a wide variety of applications such as housewares, toys, containers, bottles and industrial parts.

Polythene is injection-moulded in the conventional machines used to fabricate a wide range of thermoplastic materials. Very briefly the process of injection moulding may be described as follows. The material, usually in the form of granules, is measured in amounts corresponding to the weight of the moulding into the rear end of a heated cylinder. This cylinder contains sufficient material for a number of mouldings, and as the material is moved along the cylinder by a plunger, or a system of screws, it is heated by contact with the hot cylinder walls, finally being sufficiently fluid to enter the relatively cold mould through a narrow gate. Machines fitted with screw-plungers are of the so-called 'pre-plasticizer' type and interest in them is increasing mainly because they facilitate the dry colouring of polymer by tumble-blending with colourants and because they enable the masterbatch technique to be used in injection moulding. After a period during which the material in the mould cools and solidifies, the mould splits open and the mouldings are ejected. For large mouldings a single-cavity mould is used.

In production all the operations such as feed measurement, plunger movements and mould opening and closing are usually controlled by an automatic timer. Thermostats keep the cylinder temperatures steady.

Injection moulding now provides the largest single outlet for polythene in the United Kingdom. In 1958 over 40% of the total sales of polythene were taken by the moulding industry compared with 10% in 1952. This rapid increase in the use of polythene for injection moulding has led to a highly competitive industry, in which high output rates and the use of the smallest amount of material to give satisfactory mouldings have become prime considerations. In the majority of moulding shops machines are being used near the limit of their capacity, so that any deficiences in polymer processing behaviour are accentuated.

Polymer Design

The essential qualities of a moulding grade of polythene required by industry under present conditions are:—

(1). High output rates consistent with good surface finish.

(2). Adequate rigidity in thin sections.

(3). Good flow properties.

How these may be achieved involves a consideration of some of the fundamental properties of polythene.

(a) Melt flow index

The polymer melt viscosity is inversely proportional to the melt flow index; the higher the melt flow index the more fluid being the material at a given temperature and the faster it fills the mould. The more fluid material is preferred for injection moulding because the lower temperatures and pressures required permit faster cycles; for the great majority of applications the physical properties of high melt flow index polythene are quite satisfactory.

Low density polythene used for injection moulding generally has a melt flow index of 20, but material of lower melt flow index than this is used in special circumstances; the occurrence of environmental stress-cracking may in some circumstances dictate the choice of materials of lower melt flow index which, provided that suitable moulding conditions are used, can eliminate this fault; this is discussed at greater length below.

(b) Density

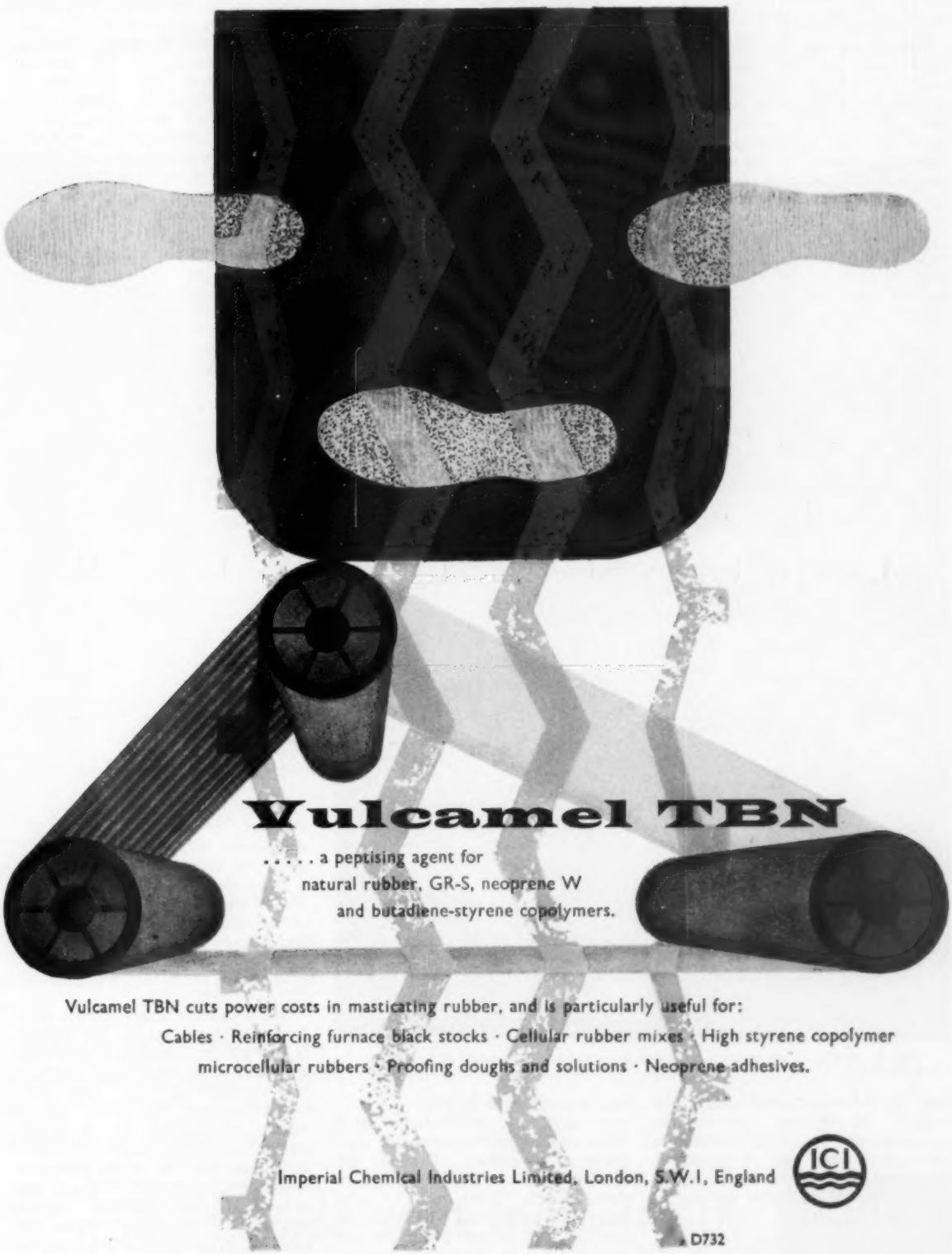
Experience with polymers of higher density than 0.918g./c.c. shows that for polymers of comparable melt flow index the higher density results in higher output rates (provided that the polymer gives acceptable surface gloss at the same moulding temperature), because the increased softening point enables early ejection from the mould cavity. This advantage is accompanied by a greater stiffness in the moulding but also by an increased susceptibility to brittle fracture, and a lower resistance to environmental stress-cracking, both of which are considered in some detail below. (It should be emphasized that this difference in resistance to stress-cracking is based on tests carried out at a constant strain; because the greater rigidity of the higher-density material resists deformation a greater stress is required to cause a break in these materials.) A compromise is therefore necessary, and this has been achieved with materials whose density is intermediate to the low density and high density polythenes. These polymers are, in fact, called 'intermediate density polythenes'; the density range covered is approximately 0.922 to 0.935g./c.c.

Environmental Stress-Cracking

The phenomenon of environmental stress-cracking has been known for some years, and the influence on it of moulding conditions has been described in detail[1]. In the design of a moulding polymer the possible occurrence of the phenomenon can be a governing factor, as it depends on both the melt flow index and on the density of the polymer.

When polythene is highly stressed in contact with certain substances such as surface-active agents, detergents, low-molecular-weight polar organic liquids, silicone fluids and vegetable and mineral oils, cracking or peeling can occur where no failure would otherwise be expected. Among polythenes of the same type, those of high melt flow index are more susceptible to the phenomenon than those of low melt flow index. Polymers of high density are more susceptible than those of low density when samples are tested at equal strain.

Although the application of high stresses to moulded objects is unusual in normal usage, such stresses may be present within the material itself as a result of unsatisfactory moulding conditions, and a full understanding of how this comes about enables this type of failure to be avoided by the



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careful choice of melt flow index, density and moulding conditions.

(a) Surface Orientation

During the injection of the polythene melt into the cooled mould cavity a considerable amount of shearing of the polymer takes place, and this results in some degree of uncoiling and orientation of the molecular chains. At the same time as this orientation takes place, relaxation of the orientation occurs; with a very fluid melt the relaxation is very rapid and is complete very soon after streaming ceases. Where the melt is more viscous, however, for instance near the cooled walls of the mould, whereas the force causing the melt to flow is sufficient to cause orientation, the relaxation forces are relatively weak and relaxation proceeds very slowly. Thus the greatest degree of orientation in a moulding, after cooling, may be expected to be retained on the surface of the moulding, although the maximum amount of orientation is produced (and relaxed) where the greatest amount of shear has taken place; which may be at some point below the surface. Nearer the centre of the moulding less shear and orientation have taken place and, of course, at the centre of the moulding where no shear has occurred, there will be no orientation.

A section of an injection moulding therefore shows a composite structure of an outer skin having a high degree of 'frozen-in' molecular orientation, and an inner section in which the orientation is much less or absent altogether.

Oriented polythene is in tension and cannot return to its unstressed state because of its own rigidity. If a composite structure such as the one described above is placed in contact with an active environment, the effect of this environment on the polythene may be such that the internal stresses cause damage to the moulding, in the form of surface delamination or peeling (Fig. 3).

In practice it is found that a high melt temperature and a high rate of injection minimize the orientation in the moulding. At high moulding temperatures the polythene has a low melt viscosity and only a low degree of molecular orientation is retained. A high injection speed results in a low overall increase in viscosity during the mould-filling stage, thus enabling a high degree of relaxation to take place.

(b) Packing

When the initial filling of the mould cavity is complete and the polymer begins to cool, a considerable amount of shrinkage takes place; it is necessary to make up for this shrinkage in order to avoid the formation of voids inside the moulding or sink-marks on its surface. The best way of obtaining a moulding free from these defects is by using a high injection pressure and a fast-freezing gate, in such a way that, after the gate freezes, the thermal contraction is balanced by the expansion resulting from decompression.

Unless the gate is frozen sufficiently quickly a continuous addition of polymer is forced into the mould cavity during the cooling contraction by the follow-up pressure. This continuous addition is called 'packing.' The temperature of the displaced material inside the moulding is falling continuously during this addition, and the correspondingly higher melt viscosity results in a high degree of molecular orientation being retained. During this stage the greatest polymer displacement and the highest viscosity occur near the gate, and this region therefore shows a higher degree of orientation from this cause than does the remainder of the moulding. This highly localized orientation in the vicinity of the sprue, or gate, has also been studied in injection moulded polystyrene, and related to the cracking observed during the ejection of mouldings and to the surface crazing caused by active solvents, in the sprue area. If a moulding containing molecular orientation caused by 'packing' is subjected to an active environment, cracking may occur in the region of greatest stress which, in this instance, is across the centre of the sprue area (Fig. 4).

Fig. 3. Surface delamination—a result of an unsuitable moulding cycle

Both peeling and cracking across the sprue can take place without the presence of an active environment, and cracking can be induced, for example, by heating the moulding to a temperature above about 60°C., when the increased thermal movement of the polymer chain allows a change in the relative positions of the chain segments; the tendency of the molecular chains to assume the normal coiled configuration results in a reduction in the dimensions of the specimen in the direction of the orientation, and a corresponding increase in dimensions at right-angles to this. If these dimensional changes cannot take place because the shape of the moulding prevents them, then the stresses may be sufficiently high to cause cracking.

Brittle Failure

The toughness of low density polythene has been one of the features of its use in household ware, toys, etc., and these have been regarded as 'unbreakable,' ever since their introduction to the market. High density polymers are not so flexible and if a moulding is subjected to such distortions that low density polythene would easily withstand, breakage may occur. It has therefore become necessary to investigate types and cause of failure and to determine the limits of density and melt flow index that can be tolerated.

Two types of failure can occur in polythene; one is usually called

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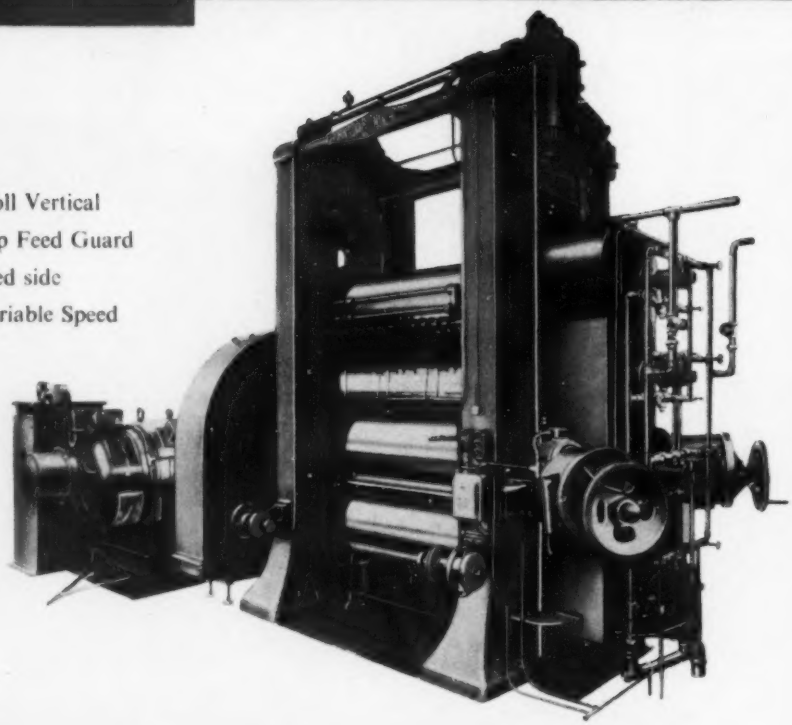

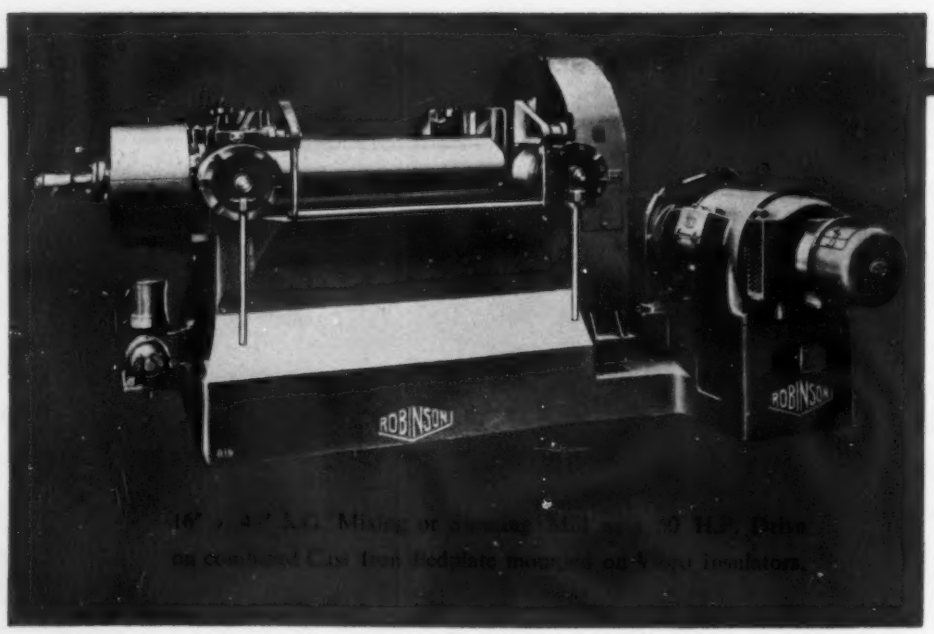

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tough failure,' and the other 'brittle failure.' The main difference between them is that the energy required to cause tough failure is large in comparison to that required for brittle failure. Because a high energy is required for a tough failure to occur, a suitably designed moulding should not fail in this way in use.

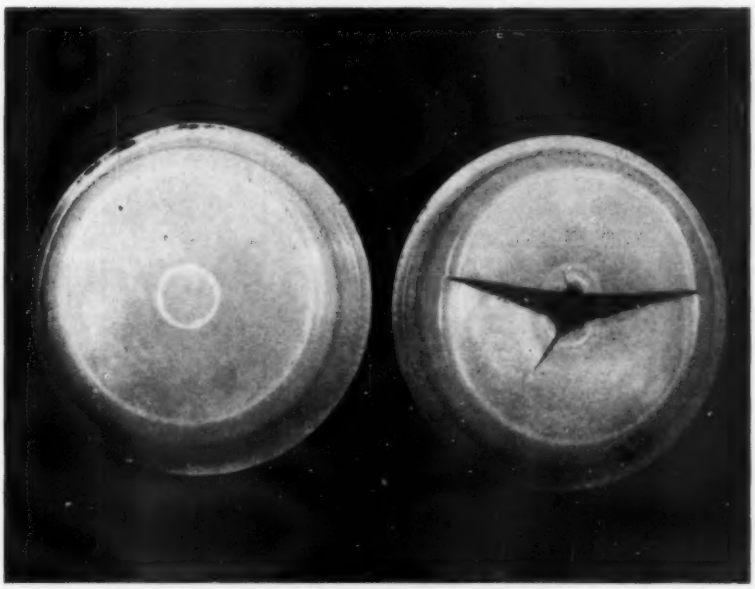

Fig. 4. Extensive cracking across the sprue area caused by the release of stresses created during 'packing'

Yield Strength

Brittle failures may be made to occur reproducibly, under conditions of tensile stress, in samples cooled to a very low temperature. It may be said that there is a transition between high-energy breaks and low-energy breaks, at the temperature where the yield strength (where non-reversible stretching begins) equals the brittle failure strength. Yield strength is dependent on temperature, rate of stretching and density; the tensile strength in brittle breaks, however, depends hardly at all on temperature, rate or density, but on molecular weight and cooling conditions. Consequently the position of the transition temperature from tough to brittle fracture is affected by all these factors, and bears no simple relation to the glass transition.

The advent of high density polythenes has created a new interest in the impact properties of the material, as some of them are brittle in use and almost all show brittle failure when notched samples are tested. The effect of placing small notches in samples being tested for brittle fracture alters the distribution of stresses in the specimen in such a way as to increase the proportion of triaxial tensile stress which favours brittle failure, and to decrease the proportion of shear stress which favours tough failure. The result is that the transition temperature from brittle to tough failure is much higher than where there is no notch.

Because these polythenes must be compared in brittleness tests to the low density materials, any impact test used should apply to the whole density range, and this has led to considerable difficulty in the selection of a suitable test. A routine evaluation test has been devised* using a small 'Dynstat,' or Schopper, pendulum impact machine in which a specimen 1 x 1 x 0.16cm., notched to a depth of 0.020cm. in its front face, is clamped in a vertical plane with the notch lying horizontally just above the lip of the clamp. The test consists in giving the specimen two blows, measuring each time the energy absorbed. Specimens are rarely broken by the first blow which usually only bends them. The energy absorbed in the second blow, expressed as a percentage of the energy absorbed in the first blow, is called the 'fracture resistance.'

Transition Region

At slightly higher densities than 0.92gm./c.c. (where the increased rigidity is the dominant factor) a greater impact strength is observed, but as the density difference becomes larger and as the dominant factor becomes the increase in susceptibility to impact failure, an overall lowering of impact strength is observed. The transition region of tough to brittle failure is defined arbitrarily as lying between the fracture resistance limits of 40% and 20%, and this is in good accordance with empirical brittleness tests carried out on mouldings. Fig. 5 shows, in terms of melt flow index and density, the tough-brittle fracture transition as determined by the double-blow Dynstat test.

It is now recognised that the higher-density polymers are fragile unless they are of low melt flow index, so that when toughness is required the fabricator has to accept the poorer processability associated with the lower melt flow index. It is unfortunately not so generally understood that an unsuitable cooling cycle can impair the toughness of some intermediate density polymers. The transition region shown on Fig. 5 is quite narrow, representing a density range of only 0.003g./c.c., which is

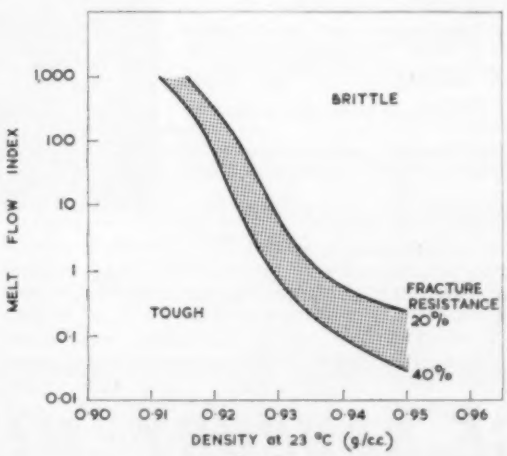

Fig. 5. Tough-brittle fracture transition, as determined by the double-blow Dynstat test

*In the laboratories of the Plastics Division of I.C.I.

Continued on page 276

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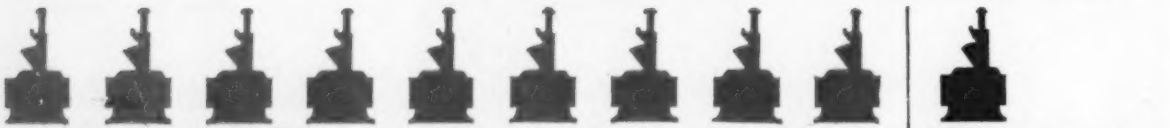

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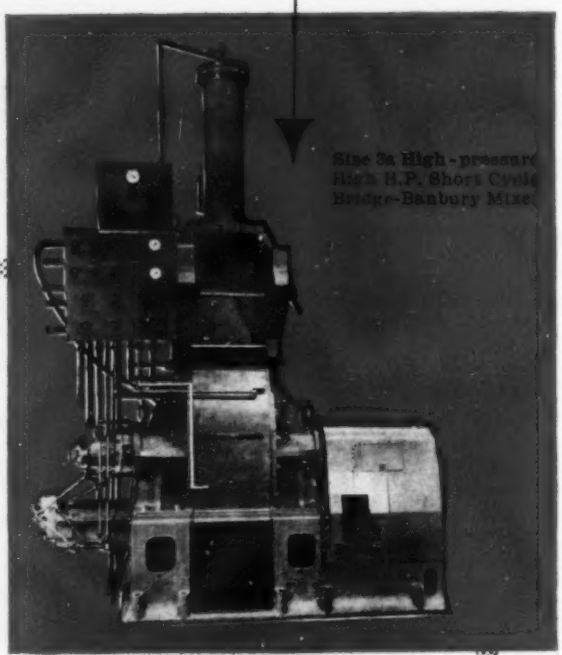

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Round the World

GERMAN NEOPRENE LINING — FRENCH PVC ROADSTRIP

RESINS for lacquers for the interior application and exterior decoration of food cans, etc., are being produced in Germany. These comprise various epoxide resins, including a new self-catalyzing stoving type, together with phenolic resin modifiers for epoxy resins. They are also producing a range of non-drying alkyds for nitro-cellulose lacquers and some short oil types for industrial stoving finishes, including new additions to the range.

Neoprene Lining

The techniques employed in the use of Neoprene as a lining material for the protection of chemical plant in Germany include surface preparation, lining with foils and adhesive under the application of mechanical pressure, and testing the lining by high-frequency discharges.

Dictation Machine

A new dictation machine has been produced in the Netherlands. It works like a tape recorder, with the difference that magazine spool and take-up spool are housed together in a plastic case. The case does not need to be opened, and when set into the machine, automatically finds its correct position.

Furan

Factors involved in preparing chromium - zinc - manganese oxide catalyst have been studied in China, as well as some of the operating conditions affecting the yield of furan, made by passing mixed furfural vapour and steam on to the catalyst. It has been found that when keeping the reaction temperature at 415°C. and concentration of furfural around 8.5 mole %, the yield of furan increases to a maximum as the space velocity is increased to the order of 980. Alternatively, when the space velocity and temperature are kept constant, the yield of furan goes up as the concentration of furfural is decreased. On the other hand, if space velocity and concentration are constant, the decarbonylation takes place most smoothly at 415°C. When the catalyst is prepared by precipitation at 60°C. and calcined at 550°C., a furan yield as high as 86.7% is obtained on passing the raw material at 130°C. without the use of porcelain filler. The space velocity is then 980, the reaction temperature 415°C., the concentration of the mixture 8.5 mole %.

Rubber Water Piping

Reinforced rubber water piping has just been installed in Norway. A reinforced rubber having an internal diameter of 20cm. is used to cross a river. There are two mains of 200 metres long, only one being used, the other being held in reserve. In the river bed a trench has been dug, 160cm. deep, and the mains have been placed in this, protected by immersed sacks of cement. The mains, supplied by a Swedish company, weigh 4 tons each. Their lowest point is situated 25 metres below the river level. Once in place, the two rubber mains are a little dearer than ordinary cast iron mains, but are less costly to instal, and resistant to corrosion.

PVC Lining Band

A plastic band in polyvinyl chloride has been produced in France. It is applied on to a lining with, in relief, a diamond point design. White, yellow or red, it is delivered in rolls 45m. long and 100, 450 or 500mm. wide. It is suitable for all road sign-strips; axial delimitation of highways, marking out of pedestrian crossings, parking stations, etc. It is applied cold, with the aid of a special adhesive with a rubber base.

New Foam Material

A material with a base of thermo-setting resin of the urea-formol type, has been developed in France. It is a foam of dazzling whiteness and extreme lightness which forms *in situ*. It is applied very quickly with a spray gun, either by injection or by projection. The foam gels immediately after application under the influence of the catalyzers it contains. This foam protects against heat, cold, noise; 5cm. thickness of the material is equivalent to a brick wall of 85cm. Its coefficient of thermal conductivity at 65% of relative humidity is 0.025 kcal/mh/deg.C. at 20°C. Its coefficient of acoustic absorption is 45% between 400 and 1,000Hz. and 18% of 100 to 400 periods. The foam will serve to fill every closed or open cavity, to treat roofs, ceilings, walls and partitions, allowing layers of air, and to isolate and protect mains. It will give maximum service wherever it is desired to protect against heat, cold and noise.

Railcar Domes

The French State Railways have designed a panoramic railway for tourist regions, the construction of which has been carried out by the Régie Nationale des Usines Renault. The two end compartments are in no way special. On the other hand, the central portion is divided into two floors. On the lower level are placed the motor installation and the baggage compartment. On the upper level is a spacious compartment offering a panoramic view of considerable extent. The dome of this compartment is composed of four elements in polyester, laminated, and of 3.5 x 2.8m. Each element is obtained by assembling two pieces, one external, the other internal, which are intimately united by means of a resin adhesive. Plastics also play a large part in the internal fitting-up of the railcar. The sealing of the external doors is obtained by two joints in rubber of hollow section, one mounted on the door, and the other in a frame bearing on the timberwork. The door is clad in a panel of laminated plastic mounted in a fastening.

Artifical Brown

A new type of artificial brown has been manufactured, the basis being colza oil of pure type mixed with mineral oils, and capable of being embodied in mixtures containing butyl rubber. The average properties are as follows: acetonic extract 28%; mineral oils 19%; free sulphur in the acetonic extract 0.8%; ash, 1. Specific gravity 1.02. The material is compatible with butyl rubber. It improves the mixtures and their elasticity, as well as their resistance to cuts and tears.

French Resin

A French company is resuming the sale of resin which improves the properties of pastes and solutions with a neoprene base by giving them greater adhesion between themselves, a better cohesion of the solution itself, and an excellent behaviour under heat. Furthermore, it reduces the tendency of the paste to spin

out, and the attacking of tissues caused by the liberation of hydrochloric acid by the neoprene.

Vulcanization by Gamma Rays

In studying the vulcanization of rubber by gamma rays, it has been found that the action of the rays is particularly enhanced by a chlorinated monomer (dichlorostyrene), a non-monomer halogenated derivate, a metal oxide (litharge) and a litharge - p - dichlorobenzene combination. A comparison between radiation vulcanizates and chemical vulcanizates shows that neither method is entirely on the better side, so that choice depends on the relevant criterion.

Polymerization of Dienes by Lithium

Little accurate data is to be had concerning the polymerization mechanism of dienes by lithium. When butadiene polymerization times are recorded they are virtually constant, whatever the lithium concentration, as long as this is above 0.0045% approx. However, there is an increase in the average molecular weight and a fall in the gel content. There is, it is noted, a similar 'threshold' in styrene polymerization by butyl-lithium.

Viscosity of Rubber

The intrinsic viscosity of rubber in the cyclohexane is independent of temperature, of the duration of solution, and of stocking, if oxygen and light are absent. This is the report of German research workers, who declare also that thermodynamic study shows that the cyclohexane is an excellent solvent. They give a number of useful values.

Polyacetaldehyde

It has been believed for a long time that the formation of polyacetaldehyde is achieved at the very moment of crystallization of the monomer. French research workers have shown that the reaction is concomitant with the fusion of the crystal, but this in no way alters the opinion that the monomer must necessarily pass through the solid state in order to macopolymerize.

Sealing Rings

The cooling of sealing rings in rubber causes a serious diminution of the radial force, the intensity of which is proportional to the initial compression. The relative change of the force varies little according to the degree of deformation of the rings, which indicates the predominating part played by loss of high elasticity, as well as the secondary role of the coefficient of linear expansion. The size of the force of contact preserved after cooling is proportional to the initial compression. The sealing rings functioning inflexion lose much less radial force after cooling.

Vinylic Copolymers

The Germans have developed a process of treating the crystalline part of copolymers of vinylic type prepared at low pressure. This is done with chloride, or by chloride and sulphurous anhydride at one and the same time.

German Bellows

From Germany comes also a spring made up of a bellows with flexible walls and presenting several plies. It is provided at its extremities with bodies serving to anchor the reinforcement linings, and in its folds are rings resisting tensile stress.

Rubber Railway Wheel and Expansion Crown

Two other German inventions are an elastic railway vehicle wheel, which comprises two rings of rubber, coaxial to the wheel, and parallel to each other. They are placed respectively in the grooves of a disc wheel, external and of medium size, and an internal disc wheel. The other is an expansion crown of special design which can yield to compression or be compressed so that a lateral detachable ring of the rim can be pushed back with the bead of the pneumatic tyre in such a way that it becomes possible to mount or displace the bolting ring.

POLYTHENE

Continued from page 273

far less than can be achieved by varying fabrication conditions.

REFERENCE

[1] Plastics, August 1958.

(To be continued)

In the second article in this series on Polythene (*RJIP*, February 13) the final paragraphs were inadvertently transposed during make-up. They should read as follows:

The electrical properties of polythene are one of its most important features. Polythene is suitable for both low- and high-frequency cable insulation and is also finding extensive use where high voltages are encountered. The most important electrical property is its very low power factor, which makes it particularly suitable for use with very high frequencies such as are encountered in TV and radar, and with radio frequencies where a very low attenuation is required, as in the trans-Atlantic telephone cable.

At temperatures above 80°C. polythene slowly oxidizes, the higher the temperature the greater being the rate of oxidation; it is often necessary to incorporate chemical agents to prevent or at least greatly reduce this effect. The main results of oxidation are an increase in the power factor and a deterioration of the mechanical properties. Oxidation is also caused by exposure to ultra-violet light. When the material is intended for outdoor use it must therefore be further protected by the incorporation of finely-divided, well-dispersed carbon black.

Table 3 gives the values of a number of properties which are virtually independent of melt flow index and density.

EMD EXHIBITION

At the first Engineering Materials and Design Exhibition at Earls Court (February 22-26) the Distillers Plastics Group will have twelve films showing continuously on six adjacent screens, demonstrating the range of products made from their synthetic resins, plastics materials and nitrile rubbers. The main feature of the British Geon display will be a scale model of a plating shop, showing ventilation ducting made from rigid PVC.

I.C.I. Dyestuffs Division will feature synthetic resins (polyesters and polyethers) and polyisocyanates used in the production of rigid and flexible foams for pipe, roof and wall insulation, door filling, and packaging. The Nobel Division of I.C.I. will include silicone rubbers used in oil seals, gaskets, cables, ducting and roller coverings.

Amongst other plastics on display are impregnated bearings (Bound Brook Bearings), nylon in the form of collapsible tanks (British Nylon Spinners), and a marine propeller (Nylonic Engineering Company). Rods and tubes of polypropylene and polycarbonate will be shown as well as nylon in sintered form (Polypenco).

Black Prices Down

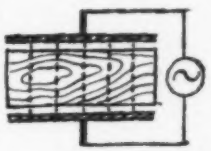
Effective with despatches on and after February 15 1960, the prices of Cabot Carbon ISAF (Vulcan 6) and FEF (Sterling SO) grades of carbon black have been reduced. New prices are as follows:

Vulcan 6, 10d. per lb. nett, Sterling SO, 7½d. per lb. nett, both ex-works Stanlow. Minimum 3-ton lots. Smaller quantities—½d. per lb. extra.

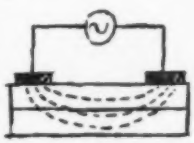
Electrical Aids in Industry *Data Sheet* **No. 10**

Dielectric Heating - 1

When an electrically non-conducting material is placed between two metal plates, called electrodes, connected to an A.C. supply, the alternating electrostatic field between the electrodes considerably speeds up the molecular movements in the material (termed a 'dielectric') as a result of which the temperature of the material under treatment rises. A similar effect is produced where the two electrodes are positioned on the same side of the dielectric; in this case the electrostatic field between them is generally known as a 'stray' or 'fringe' field.



For industrial application, the applied voltage of the order of 15,000 volts supplied by an electronic generator alternates at frequencies of some millions of cycles per second.



The amount of heat generated in the dielectric is determined by the frequency, the square of the applied voltage, the dimensions of the object and a physical property of the material termed "loss factor" and is represented by the equation:—

$$\text{Power} = 1.41\ E^2\ f.\ F\ \frac{A}{t} \times 10^{-15} \text{ kilowatts.}$$

Where E = applied voltage, f = frequency, F = loss factor.

A = area of the dielectric in square inches.

t = thickness of the dielectric in inches.

F, the loss factor, is itself equal to the expression K Cos Ø in which:
K = the dielectric constant, a measure of the property of the material to retain energy arising from disturbance of its molecular structure.

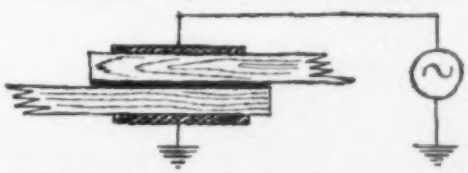
Cos Ø = the dielectric power factor of the load, that is the ratio of the power (in watts) to the product (in volt-amperes) of the voltage and current. This is a characteristic property of the material.

Therefore, "loss factor" is a property of the material and a measure of the ease with which it can be heated by this method. Like other physical properties, it varies considerably for different substances. The equation shows that the heat generated in a dielectric is proportional to its loss factor, but the rate of rise of temperature will also depend upon its specific heat and density. The following table gives approximate values of the dielectric constant, power factor and loss factor of a few typical dielectric materials for frequencies around a million cycles a second.

MATERIAL	DIELECTRIC CONSTANT	POWER FACTOR	LOSS FACTOR
Natural Rubber	2.9	0.02	0.058
Oak, dry	3.3	0.04	0.132
P.V.C.	5.3	0.06	0.318
Urea formaldehyde	7.0	0.03	0.21
'Bakelite' resin	6.0	0.03	0.18
Nylon	3.7	0.05	0.185
Water, pure	80.0	0.03	2.40
Water, tap	80.0	0.5/5.0	40/400

The high loss factor of water means that materials which are difficult to heat when completely dry will often heat efficiently when moisture is present. The voltage must be increased towards the end of the process in some cases to remove the final moisture traces, the reduction in loss factor as the material dries out providing a safeguard against overheating.

Dielectric heating of a homogeneous material is a straightforward application, heat being generated uniformly throughout. If the workpiece is made up of a number of materials, each material will heat up uniformly but each at a rate depending upon its loss factor, thermal properties and density. The degree of temperature uniformity throughout the workpiece will then depend upon the extent to which thermal conductivity can equalise different rates of heating.



Such different rates of heating can be turned to good account in certain applications. For example, in wood glue setting, the glue lines heat up much more rapidly than the wood pieces being joined and the glue sets before the wood heats up substantially, wood having a lower loss factor than glue. Dielectric heating does not depend upon any external heat source to transfer heat by conduction, convection or radiation to the surface of the charge and from thence to the interior by conduction.

Instead, heat is generated within every particle of a body placed in the dielectric field and, depending upon the uniformity of such a body, an even and extremely fast temperature rise can be achieved.

For further information get in touch with your Electricity Board or write direct to the Electrical Development Association, 2 Savoy Hill, London, W.C.2. Telephone: TEMple Bar 9434.

Excellent reference books on electricity and productivity (8/6 each, or 9/- post free) are available—"Induction and Dielectric Heating" is an example.

E.D.A. also have available on free loan in the United Kingdom a series of films on the industrial uses of electricity. Ask for a catalogue.

6776

Advertisers Announcement

VIEWS and REVIEWS

COMMENT ON SCIENTIFIC AND INDUSTRIAL MATTERS

by **Dr Schidrowitz**

Depolymerized Rubber Monomer Compositions

UNDER the above heading D. J. Elliott and W. F. Watson (BRPRA; *present address:* RABRM, Shawbury) have described an interesting subject. This forms Publication No. 326 of the British Rubber Producers' Research Association, and was originally printed in the *Transactions of the Institution of the Rubber Industry* (Vol. 35, No. 2).

Mixtures of degraded rubber and styrene which can be poured into a mould and polymerized and vulcanized are described. The products have higher tensile strengths, tear strengths, moduli and hardness values than vulcanized degraded rubber alone.

NR which has been extensively degraded as regards molecular weight by hot mastication, has been used for many years for specialized applications where its lower viscosity and more rapid dissolution than raw and normally masticated rubber has been of value. Such rubbers have been currently manufactured by mastication for several hours with a small percentage of MBT or *o—o—* dibenzamido or diphenyldisulphide (Pepton 22) at 140 to 220°C., in an internal mixer, and rubbers of viscosities down to 5,000 poises or less at room temperatures can be produced in this way.

For a number of purposes it would be convenient to have available an unplasticized NR composition which could be cast into a mould and then vulcanized without the need of applied pressure. Unfortunately rubber reduced even to a viscosity or 5,000 poises is not sufficiently fluid. Moreover the strength of the rubber after vulcanization is low and is reduced still further with the addition of plasticizers.

It is, therefore, desirable to add a liquid to the soft rubber to make a pourable mixture, and of a kind which can be changed to a material of high viscosity after casting. However, after a good deal of experimenting, it was demonstrated that pourable mixtures of heavily plasticized rubber and styrene can be polymerized and vulcanized to give flaw-free mouldings. An enhancement of the physical properties of the rubber is also obtained.

Reaction of Sulphur with 2,6-Dimethylocta-2,6-diene

Publication No. 328 of the British Rubber Producers' Research Association is by L. Bateman, R. W. Glazebrook and C. G. Moore, and is on the effects of vulcanizing additives on the reaction of sulphur with 2,6-dimethylocta-2,6-diene and their bearing on the mechanism of sulphur vulcanization of natural rubber. This paper is Part XII of the series on the Reaction of Sulphur and Sulphur Compounds with Olefinic Substances, and is reprinted from the Journal of Applied Polymer Science, Vol. 1, Issue No. 3, pp. 257-266, 1959.

The authors have investigated the effects of zinc oxide, of zinc oxide and stearic acid, and of zinc oxide, stearic acid and 2-mercaptobenzothiazole on the products of interaction of sulphur with the diisoprene, 2,6-dimethylocta-2,6-diene at 140°C. Zinc oxide alone produces little change in the composition of the complex product mixture but in the presence of stearic acid, and more so when the thiazole is also present, significant changes are produced in the distribution of combined sulphur which reflect more efficient use of the sulphur in cross-linking reactions and which can be related rationally to important effects exerted by these additives on the sulphur-vulcanization of natural rubber. Evidence is now presented that the chemical and technological effects of soluble zinc salts and of thiazole accelerators stem from their action in enhancing the role of reactions promoted by the complementary persulphenyl anionic species (TS_n) which involve the displacement of hydrogen from, and the addition of sulphur to, carbon atoms adjacent to double bonds.

Behind the Arras

'Damage by a Bamboo Rat' is the title of an item in the issue of January 1960 of the *Planters' Bulletin*, but I could not 'for the life of me' forego, for obvious reasons, the given title. However, here is *Planters' Bulletin* story of this 'fearsome but snug monster.'

'We have occasionally heard reference to "beaver damage" in Malayan rubber plantings. As beavers are confined to the colder parts of Europe and North America, the damage was assumed to have been the work of some indigenous rodent. Porcupines, known to be able to sever young plants with one bite, were particularly suspected.'

The chronicle proceeds: 'Recently, specimens have been received from an estate in Johore showing just the sort of damage which might be expected from beavers. Several 2½-year-old clonal seedlings have been felled by an animal gnawing away at the collar, just below ground level. The top of the tap root was hollowed out, and the wood bore regular tooth marks. The animal responsible was apparently living in a burrow made in an abandoned termite nest.

'The manager of the estate solved the mystery of the identity of the culprit by catching it by the tail. Its large body, short tail, large orange incisors, and yellowish body colour marked it as the "yellow-cheeked bamboo rat," *Rhizomys sumatrensis*. . . . The specimen fed on sweet potatoes and was exhibited at the MAHA Zoo.

'Similar damage was reported about the same time on two-year seedlings on a group of smallholdings in Negri Sembilan. A skull in a burrow was identified by the Chief Game Warden as that of a bamboo rat. The extent of the burrows in this area made control measures difficult.

'Because the flesh is reported to be good eating, the local people may be encouraged to catch the animals. If their burrows are excavated they can be caught in bags as they escape.'

The Chemical and the RIC 1960

The Joint Annual Meetings of the Chemical Society and of the Royal Institute of Chemistry, will be held in Belfast, it is announced, and will extend from Tuesday morning April 5, until Friday evening April 8. Application for tickets, etc., should be sent to: The Joint Annual Meetings Officer, 30 Russell Square, London, W.C.1.

PHILIP SCHIDROWITZ

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MEN and MATTERS

A Review of People and Events

by George A. Greenwood

THEY are still paying due honours at Wolverhampton and elsewhere to A. S. Bishop, upon his retirement as chairman of the Goodyear Tyre and Rubber Company (Great Britain) Ltd. Mr Bishop himself has been heard to express his surprise and gratification at it all but nobody who knows him, and the almost extraordinary links which he has been forging over the years with this great undertaking will share his surprise, for he is, in what has now become a rather hackneyed phrase, an institution.

The latest event was the farewell dinner which the company held at their pavilion at Goodyear Park. In

Retiring Goodyear board chairman, A. S. Bishop (*left*) and managing director M. S. Meyer, with the Adolph Grison oil painting, 'The Music Lesson,' which was presented to Mr Bishop by his many Goodyear colleagues at the recent farewell dinner given in his honour

paying tribute to Mr Bishop, Goodyear managing director M. S. Meyer said: 'His contribution to the industry and especially to this Company will always be remembered and appreciated.' In expressing on behalf of all present their united good wishes for a long, happy and contented retirement, Mr Meyer then presented to the guest of honour an oil painting that had been subscribed for by his many old friends and colleagues.

Other speakers included A. H. Pendree, Goodyear sales director; T. G. Smith, plant manager of the Wolverhampton factory; A. ('Sandy') Thomson, sales manager; and the man who has known Mr Bishop longer than any other serving member of the Goodyear organization, S. Oxon, O.E. accounts executive.

Now 'Limited'

Since the principles of co-partnership and profit sharing have been steadily increasing in the rubber and plastics industry during recent years —nearly a score of companies, led by I.C.I., are now practising them—it is worth noting that the Industrial Co-Partnership Association, a propagandist body, has just been registered as a company limited by guarantee, without share capital.

Among the original number of members, which is 500, each being liable for £1 in the event of winding-up, are several of these companies, the subscribers including Sir Alexander Fleck, of I.C.I. The word 'limited' is omitted from the title by licence of the Board of Trade, but it is made clear that the company will continue to encourage and promote co-partnership in industry, and will acquire the assets and liabilities of the unincorporated Association, founded so long ago as 1884.

Honoured Again

A mutual friend of many in the world of rubber said to me the other day how pleasant it was to hear that George Martin is again chairman of the Council of the Institution of the Rubber Industry, and then we began to reminisce on his long services which must, in one way or another, stretch over more than 40 years. For example, his association with the Imperial Institute began round about 1922, and before that he was serving Dunlop's in Japan. In South Kensington, of course, he was for years doing valuable work as superintendent of natural rubber for Ceylon and Malaya, but history will probably record that his most valuable efforts, both for the industry and for the State, were those which he put forth during his association with the Ministry of Supply, particularly on wild rubber, during the Second World War.

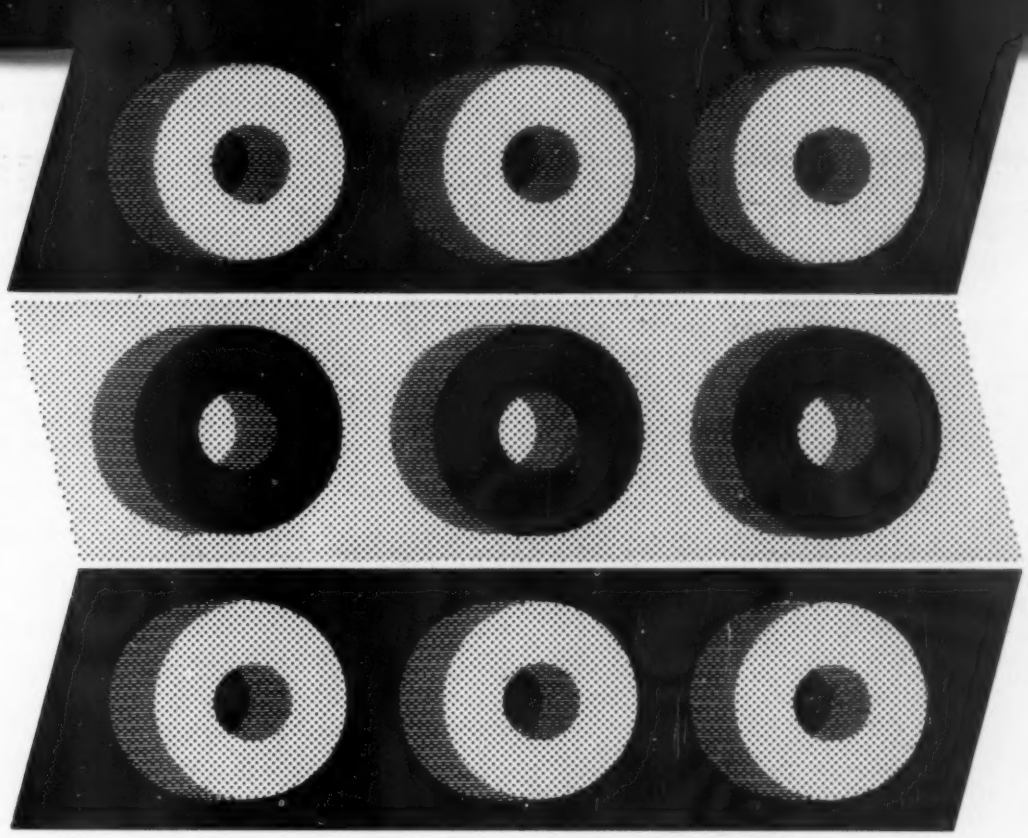
He has been much honoured, probably the greatest tribute to him being the award of the Colwyn Medal, and he is still on active service (if I may put it that way), with the British Rubber Producers' Research Association. I wonder how many people, both the experts and the tyros, are still having frequent recourse to the many scientific papers which Mr Martin has compiled and published during these four decades, and which have made him a man of such distinction.

More Changes

There is to be another change on the board of I.C.I. when, on March 24 (his 60th birthday), Mr J. L. S. Steel retires after more than 37 years' service. He has been a director since 1945 and in recent years has been responsible for the company's economic planning, with particular interest in the Common Market and the free trade areas.

His early life was spent in the North of England. From Christ's Hospital he went to St. John's College, Oxford, where he graduated M.A. with final honours in the school of natural science, and after coming down from the University, he went to Brunner Mond and Co. in Cheshire, a couple of years before that old-established concern became merged with I.C.I.

Mr J. B. Y. Hill, the present deputy manager of national sales for the Dunlop Tyre Division, has been promoted to sales manager, succeeding Mr W. A. Moens who has just retired. Mr Moens will be based at the company's depot in Albany Street, London, N.W. He first joined



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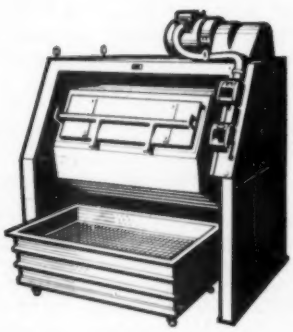

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Dunlop in 1926, as a technical trainee at Fort Dunlop.

Further Dunlop news is that Mr Dennis Hays has taken up his duties as a director of the Scottish company, to be responsible for the Dunlop activities North of the Tweed. He succeeds Mr William Sinclair who retired on January 31.

Finally, a word about Sir Walter Warboys, who has been appointed, in addition to his other new directorships, to the board of the Forestal Land Timber and Railways Co.

Here and There

I am having to write some hours before the televised Brains Trust, due to take place on Thursday (February 18), with Mr Norman Fisher in the chair, but I am looking forward to it and probably many of my readers will by now probably have anticipated and enjoyed the occasion. For us, the principal interest was that Mr Anthony Reay Mackay Geddes, O.B.E., was in the team, together with Lord Boothby and Dr Bronowski, and Mr Geddes is, of course, as managing director of the Dunlop Rubber Company, an outstanding personality in industry.

What a good many people fail to know, however, is that he is a son of the late Sir Eric Geddes, who, after being an outstanding figure in the First World War and in the House of Commons, did so much for Dunlops during the difficult post-war years. His uncle, Sir Auckland Geddes, later Lord Geddes, a great anatomist in his earlier days, was no less distinguished as President of the Board of Trade at one time, and later he went as British Ambassador to Washington.

One of next week's interesting events is the sixth Convocation of the National College of Rubber Technology which takes place at the Northern Polytechnic in Holloway Road, London, N. Time flies! It doesn't seem six years ago since this event was launched to present diplomas and prizes, which this year will be handed out to the winners by Sir John N. Dean, B.Sc., A.R.I.C., F.I.R.A., president of the Institution of the Rubber Industry, and vice-president of the Plastics Institute. The ceremony itself is in the theatre of the Northern Polytechnic, and this will be followed by a Conversazione in the National College.

North, South, East and West

Geoffrey Kent White and Henry Rothenberg, Governing Director and Managing Director respectively of the James North and Sons Ltd. Group of Companies, left England on Tuesday last on a world tour of the North factories in Canada, the USA, Australia, New Zealand, and South Africa.

The Group, already foremost in the field of PVC safety gloves and clothing, has factories and sales organizations in all important industrialized countries. On their trip it is expected that Mr White and Mr Rothenberg will also visit Japan, Hong Kong and the Rhodesias.

In the UK the recent purchase of Slack Mills by James North and Sons is a landmark in their United Kingdom expansion programme. For some years now the company has been steadily outgrowing the existing premises at Godley Mills and George Street. Slack Mills is one of the largest industrial premises in Hyde, Cheshire, recently vacated as part of the Government's cotton concentration and reorganization programme and will provide James North with all the space required for their expansion.

£1,000 Idea

Of all the bright ideas that have come out of company suggestion boxes, one of the brightest I've seen recently is expected to save the Australian Post Office thousands of pounds a year. The invention is a waterproof joint for connecting plastic cables, and it was thought up by a linesman, Neil Simons, of Sydney.

Simons worked on his invention after hearing that water getting through cable joints often put thousands of telephones out of order. Simons has been awarded £1,000—the highest award yet under the Australian Postmaster General's staff suggestion scheme.

Question Corner—105

(Second Series)

430. What is zein, and what are its potential uses?

(Answers next week)

Answer to Question Corner—104

429. In general, a number of ingredients are used in compounding epoxy resins either to effect curing, modify the viscosity or the properties required for its end use.

The epoxy resins are available in a wide range of viscosities from low viscosity liquids to solids. The choice of the appropriate one depends on the end use; *e.g.* for potting a low viscosity one is preferred, and a high viscosity type for a sealant.

There are a number of hardeners available and these are usually of the amine or acid anhydride types. They affect the viscosity, pot life and properties of the cured resin. Plasticizers are sometimes used, such as dibutyl phthalate, or tricresyl phosphate, to modify the resins but some polymers react with epoxy resins and internally plasticize them. Polysulphides, polyamides and fatty diamines react in this way.

Some dilutents react with these resins —epichlorhydrin and acetonitrile for example, reducing the viscosity. They also confer specific properties on the cured product. Fillers include mica, silica, glass fibre, asbestos, calcium carbonate and so on. They are used to improve the impact strength, reduce shrinkage or lower the cost.

Finally, pigments may be used and are best when added in the form of dispersed pastes. They are used to impart colour and opacity, but care must be taken in their selection as they must be able to withstand the high exothermic temperatures developed during cure.

(Another question next week)

Polly Ester Says . . .

'Plastics Creep—unwanted escort at the British Plastics Federation dance'

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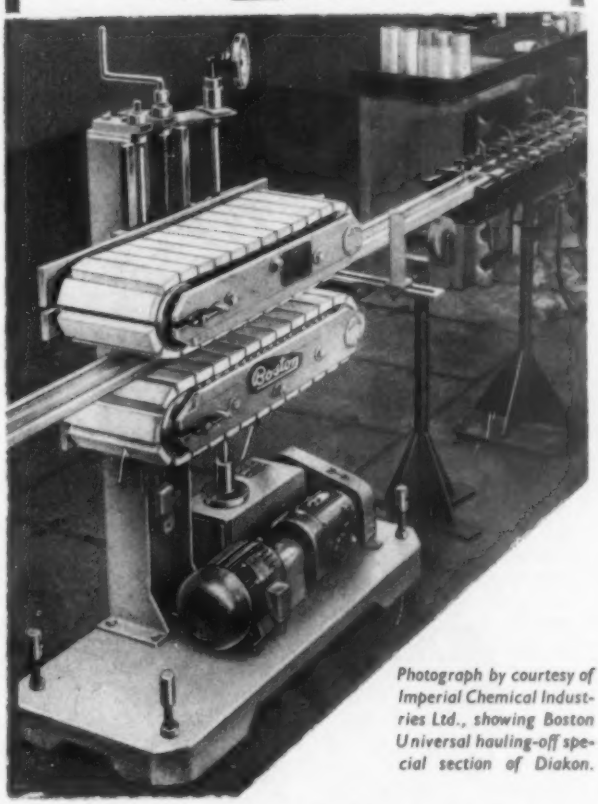

Photograph by courtesy of Imperial Chemical Industries Ltd., showing Boston Universal hauling-off special section of Diakon.

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RESEARCH REPORT

This is the first of a series of articles that will be published from time to time on the work of organizations carrying on research for the rubber and plastics industries

The Work of the RABRM

THERE are about 45 Research Associations working under the aegis of the DSIR* for various British industries. Their job is, broadly, to assist the industry to which they are attached and by which they are supported, to apply the results obtained from scientific research. To assist them the DSIR allocates block grants on terms negotiated every five years. The terms of reference are very general and are interpreted by most Research Associations as doing anything that assists the application of science to industry. Thus, in common with some RAs, the Research Association of British Rubber Manufacturers has a large Intelligence Division which is responsible for 'Rubber Abstracts' circulating throughout the world, the preparation of bibliographies and literature surveys, and providing translations of technically valuable articles to member firms. It also examines in its Technology Division new materials as they become available for the industry and offers the kind of help known as 'trouble-shooting' to the individual firm. Obviously, none of the above involves actually doing scientific research but, equally obviously, it is all concerned with the more efficient utilization of scientific methods and recent scientific knowledge by industry. So much for broad generalizations; let us now come down to details.

*Department of Scientific and Industrial Research.

It is sometimes said that the work of the RABRM is only of value to the large company with its own research staff available to read and interpret papers produced by the research staff of the Association. This is not so, indeed the next section starts with the reverse side of this feeling, for in a very diverse industry like ours all sides of the industry would naturally wish for more specialization for their own benefit. However, it is worth recounting how the Association can and does help the small firm. The point of contact is, of course, the technologist in the firm. From the Association he gets CR (Compounding Reports) reports which deal exclusively with problems of compounding. About 20 sheets of these reports are issued each year. Prominent among their contents are new compounding materials, particularly new synthetic polymers. 'Careful evaluation with adequate controls always inserted in the experimental design,'—this is the motto for this work. The new polymer or compounding material is shown in relation to existing materials; compound formulations are given together with full physical properties shown by the vulcanizates, and behaviour during processing is watched by experienced technologists. In this way a great mass of data is built up on up-to-date materials and dependent not on hearsay, not on trade literature, not even on published work from other places, but on first hand experience, on actual handling and measurement of the properties on modern, accurate apparatus. Associated with this expert evaluation is a long-term ageing programme in which materials are being stored here and in the tropics and are being examined and tested every 12 months. The amount stored is sufficient to provide test pieces every other year for 20 years and this also will build up an impressive body of knowledge correlating accelerated ageing tests and natural ageing under a variety of conditions. Some 14 different polymers are included in this programme which, together with the continuous evaluation of new materials, will keep the Technology Division staff in a most advantageous position to advise on the use and compounding of synthetic materials. No one small company could contemplate such a programme nor have the resources to carry it out, yet it is available to the technologists of such companies merely by collecting CR reports as they appear.

Let us suppose the technologist has run against trouble—say a certain product is showing bloom on storage. How does the Association help him? Research programmes on analytical work have always played

RABRM's home at Shawbury, near Shrewsbury, Shropshire

some part in the work of the laboratory staff and methods have been devised and circulated to members describing lines of attack on problems such as this. Later, they have been published to add our contribution to the total stock of scientific knowledge from which we so frequently draw. The technologist can therefore turn to this work if he has the necessary laboratory facilities. If not, he can have the bloom identified in the Association's analytical laboratory at cost price or he can come for a discussion of his problem, perhaps a demonstration of chemical spot tests and hence return with his knowledge fortified and a new look on his problem.

It should not be assumed that more fundamental research has no interest for the small firm. Work done, for instance, on the dynamic properties of rubber may be too mathematical for the technologist but, directed at design engineers, may result in increased use of small mechanical components and, possibly more important, a decrease in wrongful use thereby reducing lack of confidence, worry and complaints. As a result of 'shape-factor' investigations in which RABRM has a notable share, the design of rubber mountings and shock absorbers has been removed from the sphere of empirical trial and error; the engineer can now specify more closely his requirements, thus taking more responsibility for the design and enabling the rubber technologist to concentrate on his proper task of designing the compound and not the mounting.

Long-Term Research

The assertion that 'Long-term research can only help the large firms having their own research department' is still heard though it is much less vocal today as the products of long-term research are reaching all members of the industry. The importance of long-term research depends not only on its actual technical objective but on the climate of scientific thought which it helps to create in the organization where it is proceeding. It is extremely important to the industry as a whole that not only should research seek to extend the relevant fields of knowledge but that there should be a group of people

Dr W. F. Watson, director of Research (*above*), **Dr W. C. Wake, head of Chemistry and Physics division** (*left*), **R. C. W. Moakes, head of Technology division** (*right*)

aware of new knowledge in cognate fields, capable of assessing it, and in touch with the people who can apply it. The choice of suitable projects on which to work has to be judged in relation to possible new ideas being forthcoming and also for their impact on other work going on in the same laboratories.

It is not possible in this short article to detail every project on which RABRM are engaged. Three may be taken as typical.

The formation of block co-polymers by grafting monomeric units onto existing polymers is a relatively new idea. Their properties are interesting and likely to be technologically valuable in their own right. They also provide interest by virtue of comparisons which can be made with simple mixtures of polymers, now increasingly used and, lastly, they are likely to be of unusual interest where orientation of the molecules can occur, for example, at the interface between dissimilar materials. An important case where such an interface occurs is in a tyre between the cord and the rubber. Fundamental studies on the preparation and behaviour of graft block polymers may, therefore, lead to new adhesive dips and thus open up a new line. For these and other reasons this subject has been included in the RABRM long-term research.

A second fundamental study is the relation between friction and other properties of a polymer. We are actively concerned with the friction of PVC composition to steel. The immediate practical import of this, of course, is its application to conveyor belt design. Careful measurements of friction as a function of a number of other variables have revealed that it is a property closely related to the bulk compliance and that debris from the rubbing process remaining on the surface behaves in a predictable way in reducing friction by the fascinating production of minute plastic rollers.

A third fundamental study concerns molecular networks. The network of cross-linked molecules which is built up in the vulcanization process is by no means static. Quite apart from thermal vibration always occurring and translocation of individual links when the rubber is strained (why rubber is rubbery), some small changes are taking place as a result of chemical reaction with residual

vulcanizing agents, with antioxidants, with the surrounding air and so forth. These changes involve perhaps the breaking of some of the cross-links that have been put in by vulcanization or perhaps the breaking of the main molecular chain of the rubber, most likely both and at the same time. Fresh cross-links are being formed, probably where the fractures have occurred. The network is therefore a dynamic network, not only changing its configuration but also changing continuously its internal structure. These changes can be studied by means of a combination of continuous and intermittent stress relaxation, permanent set, and the swelling behaviour of the rubber in a suitable solvent. Clearly only 'high class' basic research can disentangle these complicated and interlocking problems behind our use of rubber and many of its current problems.

Productivity Studies

The Research Association has been a pioneer in studying productivity in mill rooms and extrusion shops. The information obtained has been found to be of great value to companies of all sizes. The information gained by a large company from the comparative trials that have been done is naturally different from that gained by a small company but both are real gains.

The truth of this was amply demonstrated in the Symposium which was organized at Attingham Park specifically to 'put across' the results of this work to member firms. Attendance was from both small and large companies and at the repeat to be run in December of this year bookings have been recorded again from

The chemistry laboratory where, among other work, members' problems are investigated

qualified staff serving both types of firm. The Association now offers a 'productivity survey' as a commodity which can be purchased at cost price by any member interested in it.

Service to the Industry

Quite a large section of the available working time is devoted to general service to the industry on the various specialist committees which serve it. British Standards serve the whole industry and whilst only a few can be on a given committee (or can spare the time and effort involved in committee work) it is important that critical unbiased technical and scientific knowledge should always be at its disposal. It is quite suitable that the RABRM with its large body of knowledge and as a neutral between producer and user, should devote time to this community service. RABRM thus prevents the burden falling too heavily on the more community-spirited individual firms. Similar considerations apply to the technical committees of the IRI. The Intelligence Division naturally assists with the work of the papers committee and the annual reports of the IRI, whilst other members assist by acting as examiners and moderators.

Maintaining Contact

All the work done by the Research Association must be communicated to members or it is done to no purpose. At first sight this is relatively easy. All that needs to be done is to write it up and post it? This is not so. The real need is to communicate the work to the member in a form he readily comprehends at a time when he needs it. Various methods of communication are employed. A bulletin is issued to which all divisions of the Association contribute accounts of their work and lists (with abstracts) of reports and translations which have just become available. Lectures are given to IRI sections and to other bodies. Probably more important than any other single way is the visit of the member to the laboratories or of the Association's staff to the member's premises. When an urgent problem arises the most efficient action to take is for the member to bring it personally to the Association. Discussion, inspection, preliminary testing, searching of the literature can all take place in the member's presence, guided by him.

Other contacts regularly maintained are less personal but also necessary. Members receive a list of patents which are open to inspection at the Patent Office. This information comes to them within a few days of publication and so well within the vital period when an objection can be lodged without legal proceedings. A service like this is only of immediate relevance to any given firm but once in a while, but then it may be worth a fortune. The Bulletin arrives every other month; Rubber Abstracts every month; other publications as and when they are ready. It is not possible to judge accurately how much saving in the buying of periodicals and books and in time of highly-paid staff in reading is achieved by RABRM doing much of the reading for the industry. It could well be much more than the annual budget for running the whole RA.

Conclusion

It will be realized from the foregoing that the work of the RABRM is interesting to its staff if exacting in its requirements. It is intended to cover as far as possible the whole range of the members' interests. This is not to say that every technical interest is catered for but that every firm can find something in its work which is connected with work going on at Shawbury. The work proceeding is in any case ultimately the responsibility of the membership, who should make their views known to the

The physics laboratory showing apparatus for measuring power factors. The floorings at Shawbury, rubber and PVC, were given to RABRM by member companies

fellow members they elected to the Research Committee and Council. The benefit to be obtained from that work is proportional to the effort made in getting to know about it, understand it, and influence it; but this is only the same for all the worthwhile things of life!

News from South Africa

THE Industrial Development Corporation of South Africa, Ltd. has decided to form a development company to consider further the production of synthetic rubber in South Africa. If this indicates that the manufacture of synthetic rubber should be economical, the corporation would consider promoting the formation of a company. The development company will be known as the Synthetic Rubber Development Co. of South Africa (Pty.), Ltd.

The corporation said that in 1950 natural rubber met 80% of world requirements, at present less than 60%, and it is estimated that by 1980 the proportion would be less than 40%. In South Africa, according to the Industrial Census of 1954, rubber supported 136 establishments and employed 10,077 people, earned £4m. in salaries and wages, and produced goods to the value of over £26m. from raw materials costing more than £13m.

Since 1954 industrial growth has been rapid and the rubber manufacturing industry is no exception. South Africa is the world's ninth most important consumer of rubber and the value of present imports exceeds £6m. a year. It has been as high as £11m. during the period when natural rubber was sold for as much as 7s. per lb.

The company will also promote a production company, in which South Africa and other financial, commercial and industrial interests shall have the opportunity to participate in the production company and to determine the form of the company.

'Netlon'

Pretoria Industrial Plastics, Pretoria, are manufacturing Netlon (a product of Plastic Textile Accessories Ltd., 25 Richmond Terrace, Blackburn, Lancs.) and as this fibre can be produced in various thicknesses it is expected that it will be used to make substitutes for jute grain bags, mosquito netting and tennis netting among other needs. Pretoria Industrial Plastics hold the manufacturing rights for Southern Africa. A certain amount of spade work has still to be done to get this material accepted among the local farming community, but it is anticipated that eventually all the potato sacks, orange and vegetable pockets needed in the Union will be made of Netlon. This material will also provide many bags for other commodities. The Pretoria factory has been equipped with the extrusion machines with the special heads needed to make this fibre, which is expected to be taken up extensively locally for decorative purposes, as bottle covers, cushion protection and the prevention of label chafing in transit.

Tyre Prices Up

The Price Controller approved an increase in the price of motor vehicle tyres and tubes. The price of motor car tyres and tubes has risen by 5%, that of trucks by 7½%.

A spokesman for the South African Tyre Manufacturers' Association said that the increases were due to the increasing price of rubber. The new price has been effective since January this year.

The last change in tyre prices was in August 1955. Since then not only have rubber costs risen, but so have coastal freights, railage and postage. The increase is estimated at about 8s. for the average car tyre.

Plastics for Packaging

South African Pulp and Paper Industries, Ltd., are now making Polyply—paper coated with polythene film. It is expected that this will enjoy a very strong demand in South African industry for various packaging purposes.

Manufacturers of small plastics items and toys enjoyed a prosperous year in 1959 and so far the indications for 1960 are even more encouraging. It is certain that a large number of new lines will be added to the manufacturing range and the output of standard lines increased. Competition between firms remains very keen.

IRI Golfing Society

MANCHESTER SECTION DINNER

THE fourth annual dinner of the Manchester Section of the IRI Golfing Society was held at the Grand Hotel, Manchester, on February 22. Again this function was well attended, 91 members and guests sitting down to an excellent dinner. The captain, S. Heywood, was in the chair. In the first of the speeches which followed, J. M. Buist proposed the health of the Golfing Society in a most humorous fashion. In a more serious vein he commented on the activities of the Golfing Society. The way in which it was flourishing was shown by the fact that there were some 186 members among the three sections.

G. C. Swann, as secretary of the society, responded by saying that it gave him pleasure to thank Mr J. M. Buist for his remarks on behalf of the society and all of its members. T. Davie, captain of the Scottish section, and present holder of the Wallwork Cup, proposed the health of the Manchester Section.

He noticed the absence of silver at the top table but felt it had something to do with the way the Manchester section acted as hosts during the Wallwork Cup weekend at Hawkstone Park last year. He said that he had to apologize for the absence of J. Gallie, the Scottish secretary, who sent his best wishes to the section.

The Manchester captain, S. Heywood, replied to T. Davie. He said, as a warning to the other sections, that the Manchester Section intended this year to remedy the defeat suffered at Hawkstone Park. He welcomed all those present and was pleased to see such an excellent turnout. The dinner, since its inauguration, had gone from strength to strength. He assured the London Section that they were looking forward to being present in force at Aldeburgh this year for the Wallwork Cup weekend.

Vice-captain H. K. Mills proposed the health of the guests, naming just a few of those present: D. D. Marshall and W. Morris (Greengate and Irwell), J. M. Buist (I.C.I.), Joe Ruffell (Durham Raw Materials), T. Davie (North British), Dr L. R. Ridgeway (Phillips). He berated these and others for not joining the Golfing Society and deriving the benefits from it.

Joe Ruffell replied on behalf of the guests, and said how he looked forward to making the trip to Manchester to be present at this function, and was sure that he was speaking on behalf of all the guests when he thanked the Manchester section and its members for their invitation and hospitality.

IRI MANCHESTER

Golfing Society Dinner

Some of those present at the very successful dinner: 1. K. H. Mills, A. Sanders, N. Wilden, Mr Hudson, J. M. Buist. 2. D. Mackay, Mr Griffiths, W. Williams. 3. H. West, R. Senior, J. Carter, 4. D. M. Edwards, Mr Bowker. 5. J. Ruffell, J. Carrington, T. Davie. 6. E. Doran, A. Fleming. 7. A. Whitehead, W. Beardon, E. Cheetham *(third from left)*. **8. C. Birkett, D. C. Jones, G. Swann** *(fourth from left)*, **E. Morris. 9. K. H. Mills, S. Heywood, P. Fox. 10. E. Doran, J. Trueman, F. Lees, G. Betts. 11. E. Foley, F. Savaage, D. D. Marshall, W. Morr. 12. T. A. Wilson, D. Mackay, F. Read.**

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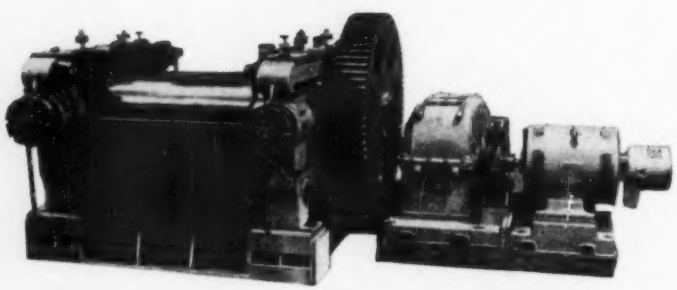

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Rubber Statistics

CANADA, WESTERN GERMANY AND FRANCE

THE Secretariat of the International Rubber Study Group has now issued details of the Canadian rubber position up to the end of September last. During the first nine months of 1959, imports of natural rubber exceeded those for the comparable period of 1958 by more than 8,000 tons or some 35%. These imports included 29,957 tons of crude natural and 3,010 tons of natural latex. Malaya was the principal country supplying this rubber with 23,861 tons, while Ceylon sent 3,180 tons and the USA 4,671 tons.

Consumption of natural during this period amounted to 30,416 tons of crude and 2,650 tons of latex, to give a total which was some 7,500 tons or about 30% higher than in 1958. At the end of September, stocks of natural stood at 3,342 tons of crude and 515 tons of latex, having fallen by some 600 tons during the course of the year.

Home production of synthetic rubber totalled 64,339 tons to the end of September, having fallen by the very large total of 33,000 tons compared with the previous year. Production of S-Type was down to 39,168 tons from the 1958 figure of 62,059 tons, while butyl fell from 19,209 tons to 11,800 tons. In addition, 24,401 tons were imported, mainly from the USA, representing a three-fold increase compared with the 1958 figure (8,411 tons). Local consumption of synthetic (a large amount of which is exported) amounted to 42,779 tons or some 9,000 tons more than the previous year, while stocks at the end of August stood at 7,750 tons, having fallen from 10,351 tons during the year.

Production of reclaim rubber in Canada during these nine months amounted to 4,571 tons, while consumption, after allowing for imports, totalled 12,910 tons. Stocks of reclaim held at the end of September amounted to 1,876 tons.

Western Germany

According to provisional figures issued in Frankfurt, Western Germany produced more than 500,000 tons of rubber products during 1959. This represented an increase of about 12% compared with the previous year, when the increase over 1957 had amounted to 3.4%. The increase in value, which totalled DM3,000m., was about 10%.

Tyre production in December, provisionally put at 18,784 tons, was again high and compared with the revised November figure of 18,288 tons; in December of the previous year, the total had only been 15,290 tons. The provisional 1959 tyre production figure is given as 203,488 tons, an increase of 37,000 tons or some 22% compared with 1958.

Output of hard and soft rubber goods during December is provisionally estimated at 22,318 tons compared with the revised November figure of 22,310 tons; this makes a provisional total for the year of 240,039 tons, an increase of some 23,000 tons over 1958.

Provisional natural rubber import totals for the period to the end of November are given as 116,551 tons, including 55,827 tons from Malaya, 14,392 tons from Indonesia, 12,032 tons from Vietnam, 11,540 tons from Nigeria and 10,540 tons from Ceylon. Imports of synthetic for the same period are provisionally quoted at 32,433 tons, including 23,282 tons from the USA, 4,271 tons from Canada and 3,501 tons from Italy.

France

The Study Group has now also issued details of the French rubber position up to the end of October last. During the first ten months of the year, France imported a total of 92,260 tons of crude rubber and 9,547 tons of latex, though taken together these amounts fell short of the previous year's imports of natural by some 15,000 tons. Malaya was still the main supplier of this rubber, with 53,048 tons, while Vietnam sent 30,860 tons. Other supplying countries included Cambodia (3,709 tons), the Belgian Congo (6,240 tons), Indonesia (2,407 tons) and Ceylon (2,997 tons). After allowing for exports of 510 tons, there remained a new supply of natural of 101,297 tons.

Consumption of natural over these months amounted to 109,678 tons, of which 10,921 tons consisted of latex, some 6,000 tons below the 1958 level. Stocks of natural on hand at the end of October totalled 5,869 tons of crude and 277 tons of latex, having fallen to less than half of the January 1 figure of 14,527 tons.

Imports of synthetic during this period amounted to 53,837 tons, representing an increase of about 5,000 tons compared with the previous year and included 39,298 tons from the USA and 8,761 tons from Canada. After allowing for re-exports of 1,731 tons, there remained a new synthetic supply of 55,602 tons.

Consumption of synthetic during these months totalled 55,614 tons, and included 39,362 tons of S-Type, 5,893 tons of neoprene, 7,577 tons of butyl and 1,607 tons of N-type synthetic. Stocks of synthetic on hand at the end of the period amounted to 8,744 tons, showing very little variation compared with the position at the beginning of the year.

Book Reviews

INTERNATIONAL SYMPOSIUM ON PLASTICS TESTING AND STANDARDIZATION.—ASTM Special Technical Publication No. 247. (Philadelphia, Pa., USA, American Society for Testing Materials, 1959, pp. vii, 269. $6.00.)

This symposium was held in Philadelphia, Pa., USA, October 30-31 1958, immediately preceding the Eighth Annual Meeting of ISO/TC-61 (International Organization for Standardization, Technical Committee-61, Plastics) held in Washington, D.C., November 3-8 1958, so that delegates could attend the symposium.

The book is in four parts, corresponding to the sessions of the symposium. The subject of the first part is national standards and includes contributions from Belgium, Czechoslovakia, France, Germany, Hungary, Sweden, UK, USA and USSR. Each contributor discusses the methods of achieving national standards in his country with particular reference to plastics. The second and third parts of the book relate to engineering and thermal properties of plastics respectively, with special reference to methods of test. The five papers on engineering properties are concerned with the fundamentals of the mechanical properties, anisotropic effects in testing plastics, specimen shape for testing shear strength, plastics as electrical insulating materials and mechanical properties at high speeds of stressing. There are four papers on thermal properties, the subjects of which are an improved flow tester, the Vicat softening point test, rheology of polymer melts and transition phenomena in the study of impact strength of plastics. The papers presented at the final session of the symposium and forming the fourth part of the book are on methods of molecular characterization.

As the plastics industry is developing rapidly it is essential that test procedure should be constantly examined. This book will be of value to those entrusted with this work as well as to all technologists concerned with any of the various aspects of the testing of plastics discussed by the contributors.

—R. W. P.

THE MUNICIPAL YEAR BOOK (London: Municipal Journal Ltd. £5 5s.)

There are four main sections to this reference book, which lists executives and departments of all local authorities in the UK. An introductory section including a buyers guide, is followed by a section on statistics; then comes the main directory with information about government departments and local authorities; and, finally, a classified list of 40,000 executives and 800 associations. Subjects from agriculture to welfare services are covered.

∴ Copies may be ordered through the Books Department, RUBBER JOURNAL AND INTERNATIONAL PLASTICS, Maclaren House, 131 Great Suffolk Street, London, S.E.1.

Plantation Share Survey

LIKE many other parts of the stock market, rubber plantation shares have had a quieter time in recent weeks. On the whole though, many continued to make steady progress.

On the statistical side, the price of 'spot' rubber has recently fallen fairly sharply, supporting the view held in some quarters that the time is fast approaching when the near landed positions will lose their premium. With Russian support lacking for the time being and with stockpile rubber available in abundance at the current price level, the long expressed prediction that the wide gap between 'spot' and 'futures' will be eliminated, now seems to be on the point of fruition. The 'gap,' at one time well over 6d. per lb., has been brought down to around 2d.; and those close to the market are looking for a further closing up in due course.

The January issue of *Natural Rubber News* states that, while world consumption of natural rubber in 1960 is expected again to exceed production for the third successive year, stockpile sales may make available to the market sufficient rubber to allow for a relatively small increase in 'free' world stocks. Production is estimated at 2.05 million tons supplemented by probable stockpile sales of just over 100,000 tons from the UK and USA national reserves compared with consumption of 2.09 million tons.

There has been clear evidence recently of a swing from natural to synthetic because of the high price level, the natural/synthetic ratio in the important American market having declined last year from 35.5% to 34.1% with a December quota of only 32.5%. The latest movement in the commodity is therefore to be welcomed.

KILLINGHALL (RUBBER) DEVELOPMENT has raised its dividend from 80% to 100%. The increase is no doubt intended to mark the company's golden jubilee, but it is also considered that it owes something to the extremely favourable prospects for both rubber and tin in the current year. Over 500 acres of the KILLINGHALL (RUBBER) estate are leased to KILLINGHALL TIN on a 10% tribute basis. Last year the return for this source owing to output control slipped from £17,700 to £9,900. A one-for-one share bonus is to be made in March, restoring the issued capital to the 1957 level. Even after this disbursement the capital cost of the rubber area will be no more than £49 per acre. Higher crops from the younger rubber and stimulation of the old feelings produced an increase of almost 25% in output. Tin receipts and income from trade investments brought the company's profit to almost the 1957/8 level of £31,000; the tax man's take amounted to £10,800 and the 100% dividend absorbed a further £16,100.

ESCOT RUBBER shareholders last June rejected a resolution which would have allowed the directors to sell the company's estates for about £90 per acre. Meanwhile, the value of the properties in Malaya has appreciated considerably and there can be little doubt that a much higher figure could now be secured from local buyers. Stock market experts obviously agree with this view as the present price of the 2s. stock units gives the rubber a net value of over £110 per acre. The yield on the shares is now around 15%.

Among the many bids and deals that arrived since we last went to press was one from LONDON ASIATIC AND RUBBER PRODUCE with an offer to buy the whole of the share capital of ORIENTAL RUBBER. Basis of the offer was six LONDON ASIATIC 2s. stock units plus 7s. in cash for every seven ORIENTAL 2s. stock units acquired. It has the approval of the directors of Oriental.

KULIM RUBBER, which has already acquired over 90% of the issued capital of KAPALA RUBBER and GOPENG RUBBER in response to its earlier offers, now plans to acquire two more group companies. They are CENTRAL PERAK RUBBER and SUNGKAP PARA PLANTATIONS. The terms are twelve Kulim and 2s. 6d. cash for ten Central Perak and twenty Kulim and 3s. 4d. cash for ten Sungkap Para. They contain a sufficiently attractive 'bonus' element to assure success.

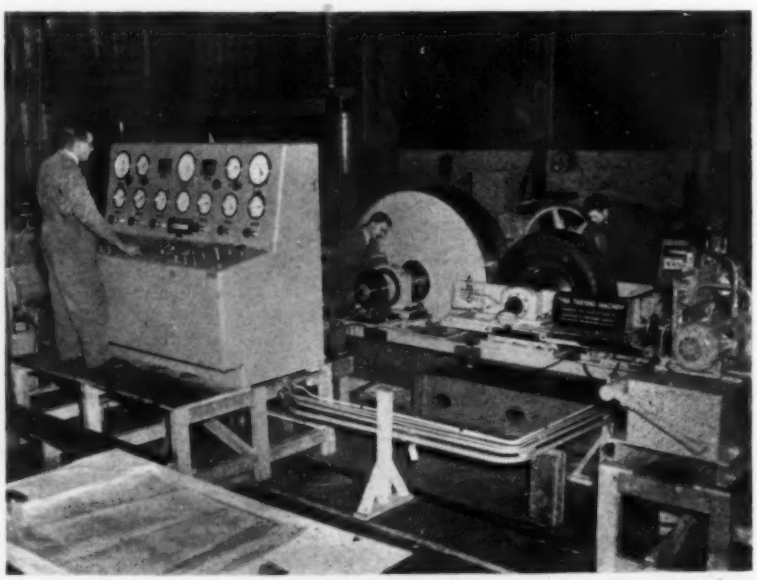
BERADIN RUBBER are stepping up their dividend from 35½% to 50%. Its net profits have improved from £24,210 to £35,096. Excellent results were also announced by ELPITIYA RUBBER. Profits here have bounded from £1,341 to £16,189, and the board of directors have hoisted the dividend 22% to 30%.

LINGGI PLANTATIONS, on the other hand, seems to cause some disappointment among the optimists in spite of the dividend increase, which has gone up from 16⅔% to 25%, tax free. The profit showing, however, is as good as could have been expected, fully supporting the recent official forecast of a 'substantial' increase. As it turns out, profits have advanced from £286,500 to £484,400.

MUAR RIVER RUBBER is making an offer of 15 shares plus 4s. 9d. cash for each of the 15s. shares of SAPONG RUBBER ESTATES. Sapong directors have accepted the terms of the offer. Muar has also declared an interim dividend of 12½% on the bigger capital, which was increased by the issue of shares against the acquisition of KLABANG RUBBER and MANCHESTER NORTH BORNEO RUBBER in respect of the fifteen months to March 31 1960.

Film for Building

A polythene film is being marketed specifically for the building industry by Marley, in thicknesses for every likely application. Some of the suggested uses are: as a waterproof membrane, as a separation medium to reduce stress-cracking, as insulation, and as a medium for curing concrete, since it retains 95% of the moisture in the concrete and eliminates the need for constant watering.



One of eight tyre test plants destined for Russia, now under construction at the Worcester works of Heenan and Froude Ltd. A further six tyre test plants are on order for Roumania

Model No. 1
HAND SHEAR CUTTING MACHINE
30", 43", 54" and 60" Length of cut.
Other Models up to 114" length of cut.

Model No. 33
POWER PUNCHING MACHINE
Platen sizes 25" × 12½", 32" × 20", 42" × 30".
Suitable for punching out vacuum formed articles.

T. KENDELL & SONS LTD.

Established 1840

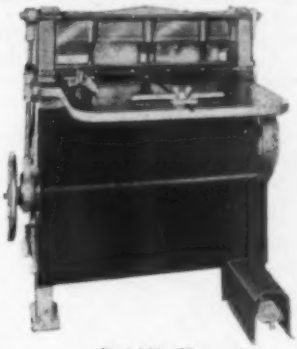
French Place, Shoreditch,
London, E.1

CUTTING MACHINERY

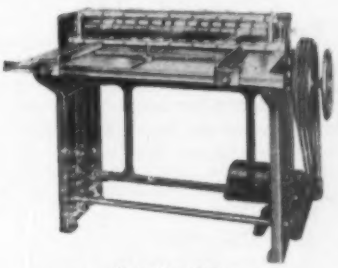
AND EDGE TOOLS

for Rubber, Sponge and Foam Rubber, Plastics, etc.

CAN WE QUOTE YOU FOR STEEL OR RIBBON STEEL CUTTERS FOR SHAPES, ETC.?



Model No. 27
POWER GUILLOTINE
Rapid cutting of sheets and strips, also Extruded Material to size. Sizes 20" and 30"



Model No. 125R
ROTARY CUTTING MACHINE
Power Operation, for Cutting Plastic and Rubber Tiles, Floor Strips, etc.
Sizes 25½", 32", 38", 52" and 72" widths.

We supply...

NATURAL AND SYNTHETIC LATEX COMPOUNDS

Pre-Vulcanised Latex

Reclaim Dispersions

Colour Dispersions

Vulcanising Dispersions

RL

RUBBER LATEX LTD. Harling Road, Wythenshawe, Manchester.

Telephone: Wythenshawe 3226/7/8. Telegrams: Compounds, Manchester.

London Office: St. Dunstan's House, Idol Lane, London E.C.3. Telephone Mansion House 1005.

Rubber Markets

LONDON

A modest demand for nearby supplies developed in the London rubber market during the week and these positions show small rises compared with previous levels. Forward positions, however, record little change. Better Eastern advices assisted the trend at one time. Prices are below their best levels and gains on the week are small. Spot, for example, is only ⅛d. higher at 33⅞d. per lb. Business generally remained at a low level.

Latest prices are as follows:
No. 1 RSS Spot: 33¾d.-34d.

Settlement House:
March 33¾d.-33¾d.
April/June 32⅞d.-33d.
July/September 31⅞d.-32⅛d.
October/December 31⅜d.-31⅝d.
January/March 30⅞d.-31d.

No. 1 RSS cif basis ports:
March 33d.-33⅛d.
April 32⅞d.-33⅛d.

Godown:
March 113½ Straits cents nominal.

LATEX

Centrifuged latex per gallon in drums, February, March, seller 20s. 2d., April-June 20s., cif European ports, Spot, 20s. 6d. Bulk, 19s. 6d. value. Creamed, seller, March, 19s. 8d. Normal, seller, March, 15s. 5d.

AMSTERDAM

The Amsterdam rubber market ruled as under on February 15:

	Guilders per kilo	
No. 1 RMA	Feb. 15	Previous
February	3.22	3.22
March	3.20	3.20
April	3.14	3.14
May	3.14	3.14
June	3.14	3.14
April/June	3.13½	3.15

Sales: 30. Tendency: Quiet.

BANGKOK

No. 1 RSS

The price for No. 1 RSS, at Bangkok on February 15 was 36.25 (36.50) US cents per lb.

CEYLON

No. 1 RSS

The price for No. 1 RSS, spot, at Colombo on February 15 was 130 Ceylon cents per lb.

SINGAPORE

At the opening on February 15, values were slightly below last week's final levels. After steadying slightly, the market became very quiet. It remained so in the afternoon and prices fell back to the opening levels. Interest in lower grades was very limited and factories were quiet. Very dull conditions continued to prevail after hours.

	Straits cents per lb., fob Malayan ports to open ports	
	Feb. 15	Prev. Close
No. 1 RSS, Mar.	114⅛–114⅜	114⅛–114⅜
Apr.	113⅜–113⅝	113⅜–114
No. 2 RSS, Mar.	113 –114	113½–114¼
No. 3 RSS, Mar.	112¾–113½	113⅛–114
No. 4 RSS, Mar.	112 –113	112½–113¼
No. 5 RSS, Mar.	109⅜–110⅞	110 –111½
No. 1 Spot ..	114 –114⅜	114¼–115⅛
No. 3 blanket thick remilled, March ..	111 –113	111 –113
No. 1 fine pale crepe, March	130½–132½	130½–132½
2X thin brown crepe, March	110 –112	111 –112

Tendency: Very quiet.

The Industries Syndicate quote latex, native produced, 60% centrifugal, packed in rectangular drums fob at 205.80d. per gallon.

DJAKARTA

No quotations made up to the time of going to press.

NEW YORK

The New York rubber market ruled as under on February 15:

DEALERS' PRICES

	US cents per lb. ex dock	
	Feb. 15	Previous
No. 1 RSS, Feb. ..	39¼a	39¼a
March ..	38¾a	38¾a
No. 2 RSS, Feb. ..	39a	39a
March ..	38⅝a	38⅝a
No. 3 RSS, Feb. ..	38¾a	38¾a
March ..	38¾a	38¾a
No. 1 RSS Spot ..	39¼a	39¼a
No. 3 amber blanket crepe, April	38½–39	38⅞n
No. 1 latex thin crepe, Feb.	43⅛n	43⅛n
No. 1 latex thick crepe, Feb.	42⅞n	43⅛n

FUTURES—REX CONTRACT

	US cents per lb.	
	Close	Prev. Close
March ..	39.00t	38.66t
May ..	38.40t	38.26t
July ..	37.85b–38.00a	37.60b–37.85a
Sept. ..	37.50t	37.15b–37.30a
Nov. ..	37.00b–37.25a	36.70b–36.95a
Jan. ..	36.25b–36.55a	36.30b–36.50a
March ..	35.90b–36.20a	35.90b–36.30a

Sales: 44. Tendency: Steadier.

Rubber futures were steady in quiet featureless trading on February 15. Physical rubber was quiet and steady. Factory interest was light. Later in the day, futures were steadier on light covering.

The Southern Cameroons shipped 811,091lb. of rubber in December 1959, a slight decrease on the December 1958 figure.

US RUBBER STOCKPILE

The General Services Administration announced in Washington on February 3 that January sales of crude natural rubber from the USA national stockpile totalled 9,580 long tons. Total sales since the disposal programme began, on October 16 1959 are 29,160 long tons. The GSA announcement said that of the 9,580 tons sold between January 1 and January 31, delivery from the Government warehouses was scheduled as follows: January 1960—470 long tons; February 1960—3,494 tons; March 1960—1,760 tons; and April 1960—3,856 long tons.

GSA listed the total tonnage of rubber available by grade on the current rotation schedule as follows, in long tons: Ribbed Smoked Sheets: No. 1X RSS, 21,788; No. 1 RSS, 11,386; No. 2 RSS, 1,142; No. 3 RSS, 2,281; No. 4 RSS, 206; No. 5 RSS, 332. Thin crepe; 1X thin crepe, 3,981; 1 thin crepe, 10,829; 2 thin crepe, 1,427; 3 thin crepe, 201. Thick crepe; 1X thick crepe, 3,981; 1 thick crepe, 3,641; 2 thick crepe, 345. Liberian Selective A, 3,236; Liberian, Regular A, 1,412; sole crepe cuttings, 183.

Racing Model

Uffa Fox has designed what is claimed to be a revolutionary new model racing yacht. The craft has automatic steering, is practically unsinkable and very light in weight, since the outer shell is vacuum formed from Bextrene (toughened polystyrene) sheet, manufactured by BX Plastics Ltd. The hull is filled with expanded polystyrene, and the keel with lead. The manufacturers, Toy Works of Marlow, are marketing eight sizes, ranging from 12–27in.

M and B Plastics

As from March 21 the address of M and B Plastics Ltd. will be 23-25 Eastcastle Street, London, W.1. Telephone LANgham 0721. M and B Plastics is a subsidiary of May and Baker Ltd.

During the first half of 1959, Jamaica imported from Canada tyres and tubes for motor vehicles totalling 4,261 units worth Can.$162,473, as compared to 2,900 units worth Can.$118,456 during the corresponding period of 1958.

R. W. Pockmire, vice-president and general manager of Goodyear Tire and Rubber Co. of the Philippines, has been elected president of the American Chamber of Commerce of the Philippines.

Industry INTELLIGENCE

Technical Data

Zalba Special

Zalba Special is a non-staining, non-discolouring antioxidant of the phenolic type. It is a free-flowing powder and can be readily incorporated into dry rubbers and dispersed in water for use in latex compounds. The characteristics and uses of Zalba Special are described in Du Pont Elastomer Chemicals Department Report No. 59-3, by R. W. Bell and D. W. Gorman, available in the UK from the Du Pont Co. (UK) Ltd., 76 Jermyn Street, London, S.W.1.

A valuable feature of Zalba Special is that it does not discolour a wide range of fabrics, including nylon, Orlon, Dacron, cotton, rayon and acetate. Besides its antioxidant properties, Zalba Special is effective as a gel inhibitor in SBR. Mixes are given showing the use of Zalba Special in the following compounds: white, black and coloured natural rubber, white neoprene, natural rubber latex dipped and cast films and foam, and neoprene latex. Data for the physical properties of the vulcanizates prepared from these mixes are included in the report.

Oil-Extension of Neoprene Latex

Neoprene latex can be extended with up to 40 phr of a light oil, the films produced having good stress-strain properties and resistance to ozone. The emulsification of the oil and its use in neoprene latex Type 571 is described in Du Pont Report BL-362, by R. O. Becker, available in the UK from the Du Pont Co. (UK) Ltd., 76 Jermyn Street, London, S.W.1.

Emulsification of the oil is effected by addition of an oil-dispersible emulsifier which allows direct emulsification of the oil into the neoprene latex without addition of water. Compounds containing 0, 20 and 40 phr of oil were prepared, results of tests on vulcanized films made from the compounds being reported. As the oil content is raised, the modulus, tensile strength and permanent set of the films decrease while breaking elongation increases slightly. Heat ageing properties are unaffected. Oil-extension reduces the resistance of the films to attack by water and ozone, but the addition of resins such as rosin esters offsets to some extent the reduced resistance, approximately 10 phr of the rosin ester being required to achieve satisfactory properties.

Geon Vinyl Latices

Geon vinyl latices are colloidal dispersions of vinyl chloride polymers and copolymers in water. There are four grades which may be classified under three types. Geon 151 and 352 are unplasticized and require the addition of plasticizer before processing, Geon 559 is preplasticized and will form films at elevated temperatures, while Geon 652 is internally plasticized and will form films at room temperature. Information on the properties and compounding of Geon vinyl latices is given in Technical Booklet No. G3 issued by British Geon Ltd., Devonshire House, Piccadilly, London, W.1.

Geon vinyl latices are designed primarily for the coating and impregnation of fibrous materials such as fabric, paper, leather and non-woven constructions to which they impart good abrasion resistance and tensile strength, excellent washing characteristics and the ability to withstand the effects of flame, water, oil and solvents. The booklet contains a detailed discussion of the compounding of Geon vinyl latices with plasticizers, fillers, pigments, heat stabilizers, anti-block agents, thickening agents and anti-foam agents.

Polysar Latex Adhesives

An important use of SBR latex is in the manufacture of adhesives, and the high solids content of Polysar foam latex makes it particularly suitable as a base for adhesives. The excellent stability of this type of latex permits high filler loadings with good compound shelf life. Water dispersions of sulphur and accelerators may be added to permit vulcanization of the dried film and the film has good colour and excellent resistance to ageing.

To demonstrate the properties of Polysar latex adhesives, a number of adhesive compounds of the kind used to bond fabrics to each other have been evaluated in the laboratory. The results are reported in Polysar Technical Report No. 8:10C, by T. E. Dunfield and G. Hilditch, distributed in the UK by Polymer (UK) Ltd., Walbrook House, Walbrook, London, E.C.4. The adhesive compounds tested were based on Polysar Latex 721 and contained clay as a filler. Data are presented graphically in the report for the following laboratory work: (1) Influence of loading of clay on shelf life, viscosity and adhesion. (2) Effect of withholding sulphur from the compounds until just before use. (3) Variation in adhesion with the weight of adhesive applied.

New Publications

Silicone Fluids

Midland Silicones Ltd., 68 Knightsbridge, S.W.1, have recently published a well-illustrated technical booklet describing the engineering applications of their range of silicone fluids. Called 'Engineering Guide to MS Silicone Fluids,' it emphasizes that silicone fluids are outstanding for their exceptional thermal stability and resistance to oxidation. All these fluids show a very small change in viscosity with temperature and resist breakdown due to shear. They are water repellent and retain good dielectric characteristics over a wide range of temperatures and frequencies. Other desirable properties are: low volatility, low freezing point, high flash point and incompatability with organic oils and polymers. The booklet has many charts and tables.

Tioxide Titanium Pigments

A brochure from British Titan (10 Stratton Street, London, W.1) gives specifications of all grades of their anatase and rutile titanium pigments.

Figures given for various grades of these pigments include specific gravity, oil absorption, relative tinting strength, relative chalk resistance and titanium oxide content. Special properties and suggested applications are listed and further technical data sheets are available.

Plastics Post

This is the title of a news sheet which will be published regularly by the Plastics Machinery Dept. of Baker Perkins, of Peterborough. The first issue came out in January and contained news of a new demonstration bay, and of an agreement signed with Triulzi of Milan.

Inerton Pump

Glen Creston Ltd., of Stanmore, Middlesex, have published a brochure on their Inerton non-metal pumps, the housing and impeller of which are made of PVC. The seal is an elastic ring-membrane made of carbon and polythene. The brochure gives applications—the pump is resistant to most acids and alkalis—costs, head capacity curves and also details of small hand-pumps for use with corrosive liquids.

Machines, Materials and Equipment

Dixon Automatic Guillotine

This machine is designed for cutting sheet rubber and plastics into strips of various widths. It will handle either uncured or cured rubber and has the advantage that only a short period is needed for setting which makes it particularly well suited for short runs. The amount of cut-off is variable up to 3¼in. from sheets up to 40in. wide and ¾in. thick. The horizontal loading table advances after each cut is made and can be controlled by a foot-operated clutch.

COMPANIES in the NEWS

BIP

The final results for the year to September 30 last of the British Industrial Plastics group reflect an upsurge of business experienced in the latter half of the period, and this phase is continuing in the current year, reports Mr C. H. Glassey, chairman.

Turnover increased to £7,871,653 from £7,217,813. Profit, before tax, was £802,916 (£698,614)—or 10.2% (9.7%) on turnover—and the dividend is raised by 2½% to 22½%.

Mr Glassey spoke at length of expansion plans, and also of resins for the paint industry in South Africa, the new West German subsidiary and the development of Filon polyester resin/glass fibre for the building industry.

UAM Group Results

The Board of Universal Asbestos Manufacturing Co. Ltd. has recommended a final ordinary dividend of 1s. 1½d. per share less tax for the twelve months ended September 28 1959. With the interim ordinary dividend of 4½d. per share already paid, this brings the total ordinary dividend for the year to 1s. 6d. per share less tax, compared with 1s. less tax for last year.

Consolidated profit for the UAM Group increased to £533,265 (from £335,237), tax taking £219,465 (£183,304).

US Rubber

The US Rubber Company attained the highest sales and earnings in its 68-year history in 1959, according to the annual report of Mr H. E. Humphreys, Jun., chairman, and Mr John W. McGovern, president.

The net income rose by 57% to 35,580,081 dollars, equal to 5.30 dollars a share, on 5,730,453 common shares from 22,670,772 dollars, or 3.05 dollars a common share, earned in 1958. The previous record was set in 1955 when the company cleared 33,559,494 dollars, or 5.04 dollars a common share.

Structural Materials

'Werkstoff - Technik,' Structural Materials Techniques is the title of Volume 36 of the Dechema Monographs (published by Verlag Chemie GmbH, Weinheim / Bergstrasse; 280 pages, 146 illustrations and numerous tables; price DM32.50).

This volume completes the reports on the series of lectures delivered at the European Convention of Chemical Engineering and the Achema Congress 1958, which were held in Frankfurt (Main).

Contents include contributions on X-ray structural analysis, on surface treatments and on the structure of plastics. Summaries of the papers in English and French are included.

One of the trade marks published in the February 6 issue of *RJIP* was given as BOSTIC. This should, of course have been BOSTIK.

Future Events

INSTITUTION OF THE RUBBER INDUSTRY

London Section.—Friday February 26 at the Café Royal, 68 Regent Street, W.1. Dinner and dance.

Scottish Section. — Saturday February 27. Smoking concert at the Ivy Restaurant with the Plastics Institute.

TRADE MARKS

Objections to the registration of any of the undermentioned applications may be lodged with the Comptroller-General of Patents, Designs and Trade Marks at the Patent Office, 25 Southampton Buildings, Chancery Lane, London, W.C.2, within one month of the date mentioned. The objections must be stated on Trade Marks Form No. 7, cost £2, obtainable through any money order office. The extracts—from 'The Trade Marks Journal'—given below are reproduced by permission of the Controller of H.M. Stationery Office.

TESLAR (787,650) Laminations of plastics included in Class 17 in the form of sheets; and sheet material made of plastics re-inforced with textile materials, the plastics predominating, for use as a substitute for window glass. E. I. Du Pont de Nemours and Co., 1007 Market Street, Wilmington, Delaware, USA. Address for service is c/o Marks and Clerk, 57-58 Lincoln's Inn Fields, London, W.C.2. (Class 17; December 30 1959).

HUFLEX (792,448) Compounds of natural and synthetic rubbers with pigments and fillers. Hubron Rubber Chemicals Ltd., Albion Works, Albion Street, Failsworth, Manchester; Manufacturers. (Class 17; December 30 1959).

THERMALON (793,989) Insulating materials consisting wholly or principally of foamed plastics, being goods for use in building construction. Commercial Plastics Ltd., Willington Quay, Wallsend-on-Tyne, Northumberland. (Class 17; December 30 1959).

FIRMOSEC (784,677) Flooring made of rubber; flooring materials made of thermoplastics; tiling made of cork or of polyvinyl chloride plastics for use in making floors; and floors and floorings (not wholly or principally of metal) impervious to electrostatic charges. Firmosec Ltd., River Road, Barking, Essex. To be Associated with No. 472,307 (2531, 2243) and another. (Class 19; December 30 1959).

DEKKOPAD (794,611) Bath mats of foamed plastics. Scrubb and Co. Ltd., Wimbledon Factory Estate, Morden Road, Wimbledon, London, S.W.19. (Class 27; December 30 1959).

RILTEX (794,568) All goods included in Class 22. Rubber Improvement Limited., Rilex House, 2 Chandos Street, London, W.1. To be Associated with No. 721,812 (3987, 703). (Class 21; December 30 1959).

INSTASEAL and SEALBOY (793,739/40) Machines for sealing polythene bags. E. R. C. Robinson Paper Co. Ltd., Packaging House, 79, Salmon Lane, London, E.14. (Class 7; January 5 1960).

CHEMPERL (789,226) Plastics in the form of sheets, rods, tubes and shaped sections, and articles made therefrom, all included in Class 17. Capital Plastics Europe Societe Anonyme, Boulevard de Berlaimont 2 and 4, Brussels, Belgium. Address for service is c/o A. A. Thornton and Co., Northumberland House, 303-306 High Holborn, London, W.C.1. (Class 17; January 12 1960).

VENTOPLAS (794,704) Flexible containers and material in sheet or tubular form, all made of plastics and for use in wrapping and packaging. F. and H. Southern Agency Ltd., 47 Southampton Way, Camberwell, London, S.E.5. (Class 16; January 5 1960).

IWORIT and IWOMERITE (794,019/20) Tiles made of laminations of plastics. Elektro Iwo Aktiebolag, Hantverkargatan, Mariestad, Sweden. Address for service is c/o Wildbore and Gibbons, 101 Leadenhall Street, London, E.C.3. (Class 19; January 5 1960).

RAYKIN (791,260) Fender buffers of metal and rubber, the rubber predominating, for fixing to dock walls and wharfs. The General Tire and Rubber Co., 1708 Englewood Avenue, Akron, USA. Address for service is c/o Mewburn Ellis and Co., 70-72 Chancery Lane, London, W.C.2. (Class 17; January 5 1960).

KOTINA (787,864) Expanded polystyrene plastics in the form of sheets, rods, tubes and shaped sections, and included in Class 17. Commerce Factors (G.B.) Ltd., Gallows Park, Torpoint, Cornwall. (Class 17; January 5 1960).

EVEREST (B773,740) Rubber hot water bottles. Boots Pure Drug Co. Ltd., 37 Station Street, Nottingham. (Class 21; January 5 1960).

WELSGLA (780,153) Synthetic resins; and mixtures of extenders, promoters and catalysts, being chemical products for mixing with the aforesaid resins; all for making up into adhesive compounds for application to material for patching holes in car bodies, boats and the like. Welsh Mouldings Ltd., Glandwr Works, Landore, Swansea. (Class 1; ...January 12 1960).

DISFLAMOLL (795,138) Plasticizers included in Class 1; and chemical products for use in the manufacture of adhesives. Farbenfabriken Bayer Aktiengesellschaft, Bayerwerk, Leverkusen (22c), Germany. Address for service is c/o Carpmaels and Ransford, 24 Southampton Buildings, Chancery Lane, London, W.C.2. (Class 1; January 12 1960).

NEW COMPANIES

Harvey and Sons (Overseas) Ltd. (648,038).—January 27. Capital: £1,000 in £1 shares. To undertake the sale and/or promotion of sales in territories outside the United Kingdom for any company, firm or person carrying on the business of tanners, curriers, manufacturers of cut soles, leather goods, manufacturers of and dealers in natural rubber, synthetic rubber, etc. The first directors are to be appointed by the subscribers. Regd. office: Royal Liver Chambers, Silver Street, Bury, Lancs.

Rubber and Tropical Produce Agents (London) Ltd. (648,095).—January 27. Capital: £10,000 in £1 shares. Regd. office: 42 New Broad Street, E.C.2.

Coral Plastics Ltd. (648,351).—January 29. Capital: £4,012 in 4,000 'A' and 12 'B' shares of £1. To carry on the business of manufacturers and wholesale and retail dealers in plastics, plastic mouldings, etc. The directors are: Ronald Holt, and Joan Holt, both of 57 Woodland, Timperley. Regd. office: 196 Deansgate, Manchester 3.

Rhodes and Crawshaw Ltd. (648,193).—January 28. Capital: £1,000 in £1 shares. To carry on the business of manufacturers and designers of and dealers in plastic mouldings and extrusions of all kinds, and moulds, tools and dies thereof etc. The directors are: Paul E. Rhodes, 3 Meadway Gate, N.W.11; James H. H. Crawshaw, 29 Boundaries Mansions, S.W.12 and Alex D. Howard.

Receiverships

(Appointment or Release)

J. G. Ingram and Son Ltd. (145,490). Indiarubber goods manufacturers, etc., London India Rubber Works, Hackney Wick, E.9.—Charles E. M. Emmerson, of 28 King Street, E.C., was appointed receiver and manager on December 29 1959, under powers contained in mortgage and charge dated May 6 1959.

H. Levine (Plastics) Ltd. (542,003). Talbot Mill, Ellesmere Street, Hulme, Manchester, 15.—Leslie H. Shipton, of 31 Lloyd Street, Manchester, 2 was appointed receiver and manager on December 11 1959, under powers contained in debenture dated December 20 1958.

Increases of Capital

Kingsholm Plastics Ltd. (615,045), 20-24 Commercial Road, Gloucester.—Increased by £7,000 in £1 ordinary shares, beyond the registered capital of £1,000.

Hecht Levis and Kahn Ltd. (212,693). Rubber merchants etc., 15/18 St. Dunstan's Hill, E.C.3.—Increased by £350,000 in 5s. ordinary shares, beyond the registered capital of £850,000.

Boyd, Briggs and Co. Ltd. (561,446). Plastic material dealers, etc., 88 Mosley Street, Manchester 2.—Increased by £4,500 in ordinary £1 shares, beyond the registered capital of £500.

PATENT LIST

Printed copies of the Specifications in the following list, published by permission of the Controller of H.M. Stationery Office, can be obtained from the Patent Office, 25 Southampton Buildings, Chancery Lane, London, W.C.2, price 3s. 6d., including postage, but about six weeks after the date of this publication will usually elapse before they come available. Orders with remittance may be sent in advance to the Patent Office, and will be fulfilled immediately the Specifications are published.

COMPLETE SPECIFICATIONS ACCEPTED

Open to public inspection on February 10 1960

Farbenfabriken Bayer A.G. Process for producing synthetic polyamides and polyurethanes of improved brightness. 827,745.

Phillips Petroleum Co. Polymerization of olefins. 827,620.

Esso Research and Engineering Co. Preparation of drying oils by the polymerization of the products from the codehydrogenation of butane and ethyl benzene. 827,623.

Ciba Ltd. Process for the optical brightening of polyester fibres. 827,992.

Whiffen and Sons Ltd. Expanded thermoplastic materials. 827,996.

British Industrial Plastics Ltd. Moulding presses. 827,777.

National Petro-Chemicals Corporation. Recovery of olefin polymers. 827,682.

Union Chimique Belge S.A. Process of preparing polymeric resins from diisocyanates. 827,713.

H. Naimer. Assemblies incorporating connecting pins of the thermoplastic materials. 827,795.

W. J. Fishenden and Son Ltd. Inflatable boats. 828,024.

Connecticut Hard Rubber Co. Vulcanizing silicone rubber gum in presence of modifiers. 827,632.

Pirelli S.p.A. Pneumatic vehicle wheel tyres. 827,633.

Montecatini Soc. Generale per L'Industria Mineraria e Chimica. Production of moulded articles from compositions based on crystalline polymers. 828,033.

Sandoz Ltd. Brightening agents for natural fibres and polyamide fibres. 827,567.

Union Chimique Belge S.A. Process for the treatment of diisocayanate-based resins. 827,715.

Montecatini Soc. Generale per L'Industria Mineraria e Chimica. Method for the purification of propylene high polymers. 827,804.

Open to public inspection on February 17 1960

Agricola Reg. Trust. Method of working expanded synthetic resin materials and articles made by the method. 828,154.

K. Ziegler. Process for purifying polyolefines. 828,198.

Ciba Ltd. Process for the optical brightening of materials composed of polyester resins. 828,545.

Farbwerke Hoechst Aktiengesellschaft Vorm. Meister, Lucius and Brüning. Epoxylation products of unsaturated fatty acid amides and a process for their manufacture. 828,203.

Farbenfabrik Wolfen Veb. Process for the manufacture of vinyl pyridines and vinyl quinolines and their homaloques. 828,205.

Carborundum Co. Method of making dense silicon carbide articles. 828,211.

Flax Corporation. Method and apparatus for forming hollow articles of thermoplastic materials. 828,448.

Polymer Corporation Ltd. Low-temperature polymerization of iso-olefins. 828,536.

Polymer Corporation Ltd. Low-temperature polymerization of iso-olefins. 828,537.

F. Hilton. Derivatives of unsaturated rubbers. 828,319.

Dow Chemical Co. Stabilization of polymerized ethylenically unsaturated materials 828,320.

Imperial Chemical Industries Ltd. Polymerization process. 828,326.

US Rubber Reclaiming Co. Inc. Processes for reclaiming vulcanized natural and/or synthetic rubber and for producing reaction products therefrom. 828,162.

Phillips Petroleum Co. Method of vulcanizing polymeric materials and product thereof. 828,328.

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